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Agriculture and Animal Husbandry in India

1933-34 & 1934-35.

Part II. —Animal Husbandry



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PREFACE.

"Agriculture and Animal Husbandry in India", formerly called the Review of Agricultural Operations in India, for 1933-35 (Part II) is based on the Annual Reports of the Veterinary and Agricultural Departments of the Provinces and States, the Reports of the Imperial Agricultural Research Institute, New Delhi and the Imperial Veterinary Research Institute, Muktesar, for these two years. The Review is issued in two parts. Part I deals with Crop Production and Part II with Animal Husbandry. It is proposed to publish this review annually in future.

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Agriculture and Animal Husbandry in India, 1933-34 and 1934-35.

Part II. Animal Husbandry.

CHAPTER I.

LIVE-STOCK.

1. General Remarks.

In spite of the financial depression which prevailed during the period under review, some progress was made in the development of animal husbandry. Provincial measures for the improvement of cattle were continued on the lines referred to in the last review and, in some cases, were further developed. In the Punjab, North-west Frontier Province, Bombay, Central Provinces and Assam, for example, the numbers of approved or subsidized bulls in service were materially increased.

Progress was also made, notably in the Punjab, Bombay and North-west Frontier Province, with the registration of approved stock and their progeny. In addition to stimulating interest in pedigree breeding, such registration has the great advantage that private breeders are thereby enabled to make money from the sale of such high grade stock as they produce, either for breeding or for commercial purposes, and are thus encouraged to carry on the breeding of pedigree stock as a business.

In the Punjab, for example, as a result of systematic animal husbandry work carried on by its Veterinary Department, internal trade has been stimulated, and a very considerable export trade in improved young stock has been developed for breeding purposes. Considerable numbers of young bulls have been purchased by other Governments, notably, the United Provinces and the North-west Frontier Province, for the improvement of their stock, and it is noticeable that there is a steady and increasing demand for

pedigree animals. There is thus no apparent reason why, with similar systematic control and development, other provinces and states, in which cattle can be satisfactorily bred and reared, should not develop their resources in the same way for the benefit of the people. In the Bombay Presidency also the breeding and rearing of high grade stock has been greatly stimulated by controlled breeding and the registration of improved stock in certain selected breeding areas, and it is reported that the prices realised for pedigree stock are now much higher than those of stock whose pedigree is unknown.

A development which is fraught with great possibilities, for the improvement of cattle in India, is the movement which was started many years ago to interest *pinjrapoles*, *gowshalas* and similar institutions in the better care of their animals and latterly in the improvement of cattle ; by systematically controlled breeding and the production of milk and dairy products in their institutions, as a corollary of their normal function of saving cows from slaughter.

Every year, in addition to large numbers of derelict animals of little or no commercial value, numbers of good milch cows are received at *pinjrapoles*, which formerly were lost to breeding and eventually died without rendering the further service to the country and the people of which they were capable. But of recent years notably in the Bombay Presidency and to some extent elsewhere, a movement has been gathering force which is capable, under proper direction, of giving the much-needed assistance in cattle improvement. Several *pinjrapoles* have found it profitable to mate their better females with good bulls maintained by them and as the revenue derived from the milk and dairy products more than cover the cost of rearing the young stock, a regular supply of well-bred young sires of known origin can regularly be obtained at no extra expense. Such work has the great advantage that the patrons of these institutions, every time they visit them, receive an object-lesson in what can be done by maintaining their herds in accordance with modern principles of breeding, feeding and management ; and in cases where the patrons are largely zemindars of the surrounding country, as in the case of the Delhi *pinjrapole*, it is noticeable that they are impressed by the much higher level of general care and

the marked improvement in the young stock which can be attained with the same income from subscriptions. It is now clear that this movement should be developed to the fullest possible extent throughout India, on account of its great potentialities in connection with systematic improvement of cattle and as an educative factor.

In the North-west Frontier Province marked progress has been made in the improvement of stock by the strictly controlled animal husbandry work, including registration of approved stock, which has been carried out by the Veterinary Department for some years past. But, on the whole, the numbers of improved stock produced on Government farms and of approved and subsidized bulls in service are still deplorably small in comparison with the huge numbers of cattle there are to improve. Good cattle are bred on Government farms, but these, as a rule, are of very limited extent and it seems obvious that, except where very extensive breeding operations are possible, as in the case of the Hissar Farm, the only feasible method of producing the very greatly increased numbers of improved sires which are needed is to give systematic Government assistance to private breeders to produce the required numbers.

The organization of Animal Husbandry is, in fact, urgently needed throughout India, and in this matter some progress was made during the period under review, but mainly at the centre. For example, at the suggestion of the Animal Husbandry Expert to the Imperial Council of Agricultural Research, a proposal was accepted by the Provincial Economic Conference that much increased facilities were needed for the development of a Dairy Industry in India and as a result of the recommendations of this Committee a Government of India grant of Rs. 6 lakhs, spread over five years, was obtained to provide a research creamery for experimental work on the handling and processing of milk and dairy products and to extend the existing facilities at the Imperial Dairy Institute, Bangalore.

Proposals were also put forward and have since been carried into effect to create a separate office for dairying under the Government

of India and to provide separate institutions for research in animal nutrition and for the study of poultry diseases and poultry problems at Izatnagar, in collaboration with the Imperial Institute of Veterinary Research at Muktesar.

Another important step was the establishment of the nucleus of an All-India Bureau of Animal Husbandry under the Imperial Council of Agricultural Research, for the purpose of collecting, collating and disseminating information. In addition to furnishing available information concerning the development of animal industry in India, this Bureau proposes to undertake the periodical publication of milk-records and other data to demonstrate capabilities of Indian live-stock under improved conditions of breeding and management.

At present the work of such a Bureau is seriously handicapped by the lack of provincial animal husbandry organizations which could undertake the collection of similar data and by the almost total absence of such trade statistics for animal products as are nowadays available in all progressive live-stock countries.

A considerable amount of valuable information has, however, been obtained from existing records, and the publication of this has focussed attention on the great economic possibilities of Animal Industry in India. With the appointment of the Agricultural Marketing Adviser to the Government of India, the possibilities of developing these industries, along lines similar to those followed in more progressive countries, have been greatly increased.

Improvement of the classification of live-stock previously given in the Cattle Census of India and the registration of pedigree stock of seven of the best milch breeds of India are other matters which have been taken up by the Animal Husbandry Bureau after reference to Provinces and States. A new census classification was introduced, to secure more detailed information on a number of points which were not previously dealt with, and arrangements have been made to form special committees to define the breed characteristics of seven of the best dairy breeds of India.

Standing Committees of the Imperial Council of Agricultural Research on Breeding, Nutrition and Dairying were formed to

deal with these matters as questions arose, and special committees were formed to consider such matters as co-ordinated research on sheep- and goat-breeding at suitable centres, to co-ordinate helminthological research, to consider the possibilities of developing bee-keeping and the trade in wool and hair.

2. Contagious Diseases and their Control.

The following table shows the total reported mortality from contagious diseases among cattle in the British provinces of India during the five years 1930-35 :—

1930-31	1931-32	1932-33	1933-34	1934-35
3,16,910	2,70,413	3,00,317	2,86,592	1,99,458

It will be observed that the figures for 1934-35 show material reduction. The United Provinces still continued to record the greatest mortality, followed by Madras, Central Provinces and the Punjab. The proportionate mortality on account of rinderpest during each of the above five years was as follows :—

Year	Rinderpest	Total mortality	Percentage of the total
1930-31	203,758	316,900	64
1931-32	182,441	270,413	67
1932-33	209,524	300,317	70
1933-34	179,877	286,592	63
1934-35	125,459	199,458	62

The percentage of deaths among the inoculated was 0.23 and 0.17 respectively during 1933-34 and 1934-35. At the Imperial Institute of Veterinary Research, Muktesar, the Serology Section continued to devote a considerable amount of time to experimentation designed to perfect their tissue-virus method of vaccination for the control of rinderpest by means of the fixed goat-virus of reduced virulence for the ox tribe which has been maintained at that institute for years past.

Owing to the striking success which has attended the use of this attenuated virus in various provinces and states, a rapid change is taking place in regard to the measures adopted for the control of this disease, and there was a notable drop in the demand for anti-rinderpest serum in consequence.

In Bengal some twenty-eight thousand animals were protected with tissue vaccine during 1933-34, and the results were highly satisfactory. Outbreaks were promptly checked and there was no instance of the disease recurring among vaccinated animals. Moreover, a number of these were tested, upto a maximum of two years from the time of inoculation, and in all cases the immunity conferred by this method was found to be a solid one.

In the Central Provinces a similar method of vaccination with the blood of goats inoculated with this same fixed virus, obtained from the Imperial Institute of Veterinary Research, Muktesar, was introduced by the late Major Stirling, and the results were also satisfactory. During the period of review, this method was however used only for the protection of cattle not at the time exposed to infection.

Among the most satisfactory features of these new methods of rinderpest control are their extreme cheapness and simplicity in comparison with either the serum-alone or serum-simultaneous methods previously employed. For example, it is stated that as many as 2,500 doses of tissue vaccine can be obtained from one small goat costing about Rs. 5, while for the blood-virus method 500 doses may be obtained from a goat. Another great advantage of these methods appears to be that, though in a large proportion of cases there may be hardly any appreciable reaction, the immunity in all appears to be a solid and lasting one, upto three years which is the longest time after inoculation at which it has so far been possible to carry out controlled tests. Furthermore, by using vaccine without serum the danger is avoided, which formally was a very definite one, that too much or too potent serum might be used in the serum-simultaneous method and the reaction so completely blocked out as to prevent lasting immunity being produced.

One or other of these two methods of protection, by means of goat-virus of reduced virulence for the ox, was under investigation in all provinces and some states during the period under review, and it seems clear now that, owing to its comparatively high cost and the short duration of the immunity, the serum-alone method is likely to fall into disuse in India for the protection of indigenous plains cattle and to be used in future only for the control of severe reactions in specially susceptible animals, such as those which have a high portion of European blood.

**Surra.* During the period under review, the systematic treatment of surra with Naganol, alone or in combination with Tartar emetic, was extensively tested, and the results are reported to have been very satisfactory. In the Punjab, where this work was first taken up on an extensive scale, it was at first necessary to establish surra-control centres at veterinary hospitals and dispensaries, and to provide a suitable diet free of cost, since proper feeding is an essential part of any such treatment. But the results are reported to have been so generally satisfactory that it is anticipated that this will not be necessary in future to the same extent and that the control of surra by this means will make steady progress, particularly amongst owners of valuable stock.

As a result of the systematic investigation of stock diseases which is now being carried out in all British Provinces and some Indian States by Disease Investigation Officers, it has, moreover, been shown that fatal outbreaks of acute surra amongst cattle, are far more common in various parts of India than was previously understood, death being so rapid that anthrax was liable to be diagnosed and no post-mortem examination made. This acute form of surra also yields satisfactorily to Naganol and Tartar emetic treatment and, with the improved facilities for early diagnosis which now exist, mortality from this cause should in future be much reduced.

In the Central Provinces, the method previously mentioned of protection against rinderpest by vaccination with blood taken, at the height of their reaction, from goats inoculated, with the Muktesar fixed strain of goat-virus, was extensively employed and

results were very satisfactory. The numbers of inoculations performed during the two years under review were as follows :—

	1933-34	1934-35
1. Serum-alone method	237,820	198,037
2. Goat-virus (blood)	13,374	3,155
3. Goat-virus plus serum	1,465	594

In Madras 32,911 cattle, including buffaloes, were immunized by the blood-virus method of vaccination during 1934-35, and the results showed that it could safely be adopted in place of the serum-simultaneous method for the immunization of healthy cattle.

3. Local Diseases and Public Health Work.

The following table shows the number of cases treated at veterinary hospitals and dispensaries and by Veterinary Assistants on tour in British India during the three years, 1932 to 1935 :—

—	1932-33	1933-34	1934-35
Hospitals and Dispensaries	2,634,406	2,830,152	3,008 571
On tour	1,750,311	1,814,791	1,969,869

It will be observed that there was a steady increase in these figures. The number of hospitals and dispensaries were 1,038, 1,043 and 1,059 respectively during the three years, 1932-35.

Among other activities, provincial veterinary staff carried out a considerable amount of meat inspection and investigation of cases of criminal poisoning and malicious injury, as well as being responsible for disease control under the Glanders and Farcy Act in Calcutta and Bombay. Further, the very great deal of work which is gratuitously carried out every day by Provincial and other Veterinary staffs in the treatment of cases convicted under the Prevention of Cruelty to Animals Act deserves special mention.

4. Breeding Operations.

(a) **Cattle.** In MADRAS the Deputy Director of Agriculture, Live-stock, remained in charge of the Hosur Farm, and the number of cattle maintained was increased to 617 during 1934-35 from

532 during 1933-34. The Sindi herd continued to do well at this farm and the demand for bulls of this breed was greater than the supply. The building up of a pure Kangayam herd by selection was continued, but the experiments in cross-breeding with European cattle, which were previously carried out at this farm, were discontinued. The breeding of Ongole cattle was also discontinued in 1933, but a foundation herd of Hallikar cattle was started by the purchase of stock from the Mysore State. The general policy as regards live-stock improvement in the province was, however, controlled by the Director of Agriculture.

In BOMBAY the system of cattle improvement previously adopted with 'A' and 'B' zones was discontinued. Under this system the Live-stock Expert was responsible for breeding in 'A' zones, where the cattle were of a reasonably pure type and intensive breeding was done; while 'B' zones, which were under the control of the Deputy Directors of Agriculture, included all the areas where the cattle were less pure and where bulls produced in the 'A' zones could be satisfactorily employed. Breeding control throughout the Presidency has now been concentrated in 'Cattle Breeding Centres' under the control of the Live-stock Expert.

On 1st July 1935, 279 premium bulls and three buffalo bulls were placed out in the various divisions of the Presidency and the total number of pedigree stock registered was 622 during 1934-35, as against 1,478 in the previous year.

Proposals for the improvement of live-stock under the special grant for rural uplift were accepted and will be put into operation as soon as finances are available.

An Act entitled 'The Bombay Live-stock Improvement Act, 1933' was passed during the period under review, giving power to Government to order that in specified areas all bulls, which have not been licensed for breeding, shall be castrated. Rules under the Act have now been published and their application is to be taken up.

The aim of the Department was to breed a dual-purpose breed of cattle, but steady progress was made in improving the milking

capacity of the Kankrej herds at Chharodi and Surat, while reports of all the cattle farms showed that by systematic selection, breeding and proper care earlier maturity and greater regularity in calving could be ensured. These farms continued to produce pedigree stock and to issue bulls to meet the demand for premium bulls for the improvement of village cattle. The Bombay Gaorakshak Mandali also did good work on the improvement of cattle on the Kandivlee Farm and schemes were under preparation to utilise the resources of the *pinjrapoles* and *gowshalas* of the Bombay Presidency for organized improvement of cattle in their vicinity. The utilization of *pinjrapoles* in this way for the improvement of local breeds of cattle and incidentally to produce milk under satisfactory conditions should, with systematic development, become a very important measure of live-stock improvement throughout India. Experience has shown that subscribers to these institutions can, by this means, be educated in the proper care and management of their cattle, while their former religious objection to castration has been, to a very large extent, overcome by the adoption of the Burdizzo's bloodless method.

In SIND the extensive development of live-stock and live-stock industry, which is required, is still very severely handicapped by the lack of an animal husbandry organization competent to deal with the scientific investigation of live-stock problems and the systematic development of industries connected therewith. A small herd of Sindi cattle was maintained at the Government Fruit Farm, Mirpurkhas, comprising twenty cows and one bull, the remains of the Red Sindi herd formerly maintained at the Willingdon Cattle Farm, Malir, but a marked reduction in milk-yield is reported to have taken place in these animals compared with the standards previously reached. A little breeding of buffaloes for the improvement of the Sind Murrah buffalo was carried on at the Agricultural Research Station, Sakrand.

In BENGAL considerable progress was made in the improvement of live-stock in the districts of Malda and Rajshahi and Nadia and Hoogly, where live-stock officers were posted. The Rangpur Cattle Farm was closed on account of its unsuitability as a stock

farm and the best of the Haryana and half-bred stock were transferred to Dacca. At the Dacca Farm the herd consisted of pure-bred Sindis, Harianas, a few Tharparkars, as well as crosses of Sindi \times Bengal, Haryana \times Bengal and a small herd of Murrah buffaloes. The Farm aimed at the improvement of their stock and the supply of suitable bulls to districts, but not at dairying. With the increasing number of bulls, considered by the Live-stock Expert to be suitable for stud, there was an increasing number of applications for premia. The question whether the funds devoted towards premia could not be better employed by providing honoraria and prizes to bull-keepers in districts was under consideration.

In the UNITED PROVINCES the charge of cattle-breeding was held by the Deputy Director of Agriculture, Bundelkhand Circle, who controlled the cattle-breeding farms situated in the Muttra, Jhansi and Kheri districts and in the Bhabar and Tarai Estates. In addition to having charge of agricultural operations in his circle, he was responsible for the improvement of cattle throughout the province.

The building up of pedigree herds of the following indigenous breeds was in progress at the farms noted against them.

- (1) Hissar breed . . . Madhurikund and Bharari Farms.
- (2) Sahiwal breed . . . Manjhara Farm.
- (3) Ponwar breed . . . } Hempur Farm (Tarai and Bhabar).
- (4) Kherigarh breed . . . }
- (5) Murrah buffaloes . . . Madhurikund Farm.

Sahiwal cattle and Murrah buffaloes were bred for milk production, Hissar cattle on dual-purpose lines and Ponwar and Kherigarh for draught only.

Stud bulls were purchased largely in the Hissar-Haryana tract of the Punjab and were formerly distributed as a free loan for stud purposes, but since 1933-34 a charge of Rs. 22 per bull has been levied. 325 bulls were distributed during 1934-35, as against 475 in the previous year.

In the PUNJAB cattle improvement measures may be divided into four sections, viz., (1) at the Government Cattle Farm, Hissar,

(2) at Grantee Farms, (3) in Special Breeding Tracts, and (4) General Breeding Control in other areas.

The Hissar breed of cattle is essentially a draught breed and 431 bulls in 1933-34 and 750 bulls in 1934-35 were issued for breeding purposes from the Hissar Farm. A few of the best milch cows are, however, now being formed into a separate herd at this farm for the production of cattle of a definite milk strain, for distribution in areas where such cattle are wanted.

There were six Grantee cattle farms, four in the Montgomery District and two in the Multan District, and large numbers of valuable stud animals as well as good milch cows of the Montgomery breed were bred at these farms. Many cows yielded 4,000 lbs. of milk in one lactation and seventy-four yielded over 6,000 lbs. during the year 1933-34. 524 bulls in 1933-34 and 587 in 1934-35 were issued free of charge by grantee farm-owners.

For Cattle-breeding in Special Tracts, there were 242 bulls on the strength of the Hariana Scheme in 1934-35 and 76 District Board bulls and 279 subsidy bulls were at work under the Dhappni Scheme. It is stated that the grant of a subsidy to cows had a beneficial effect as regards improvement of young stock. The number of castrations performed in the two years was 1,068,840. The number of approved stud bulls in this province was 4,182 in 1933-34 and 4,686 in 1934-35.

The work of the Department was assisted by the appointment of a Commissioner for Rural Reconstruction in the Province. Live-stock breeding and better organisation for the sale of milk and ghee in towns were among the subjects which engaged his attention.

A photographic record of live-stock in the well known breeding areas in the province, started in 1933-34, was completed in the Dhanni tract in 1934-35.

BIHAR AND ORISSA. Cattle-breeding in this province is partly under the Director of Agriculture and partly under the Director of Veterinary Services. Herds of Tharparkars and Sahiwals were maintained at the Agricultural Farm at Kanke and their milking efficiency was considerably enhanced. At Sabour a little work on improving the Hansi-Hissar herd was continued, and at the Veteri-

nary College, Patna, an extensive herd of pure-bred Tharparkar cattle is being built up under the control of the Director of Veterinary Services. The buffalo herd at Sepaya suffered severely from disease during the year 1934-35 and the issue of buffalo bulls has since been discontinued largely owing to lack of a satisfactory organization for their supervision and breeding control.

The Civil Veterinary Department controls cattle breeding at the Dairy Farm at Patna, which is maintained as a breeding centre for the improvement of cattle of the Shahabad area and is mainly concerned with increasing milk-yield in this dairy tract by providing pure Tharparkar sires, born and reared on the farm. The Civil Veterinary Department also maintained a certain number of stud bulls at veterinary hospitals.

In ASSAM the former temporary post of Live-stock and Dairy Expert was converted into a permanent post of Deputy Director of Agriculture (Live-stock) from 1st April 1934. The quinquennial cattle census held in January 1935 revealed a seven per cent. increase of oxen but a decrease of five per cent. of buffaloes in comparison with the figures for 1930. There were twenty-seven cows to each breeding bull, but a large proportion of the latter were inefficient and needed castration and replacement by superior bulls.

During the year a start was made to organise breeding in selected villages. A centre was started near Palasbari in the Kamrup District and a post of Agricultural Inspector (Live-stock) was sanctioned for the Surma Valley with the object of starting similar work there.

The total number of breeding animals and young stock owned by the Department on the 31st March 1935 was 786, compared with 672 on the 31st March 1934.

The Khanapara and Sylhet Farms and the cattle section of the Jorhat Farm were carried on purely for breeding and experimental purposes, and the general breeding plan continued as in the previous year. At the Khanapara and Sylhet Farms, herds of local cattle were graded up by the use of Sindi bulls and herds of pure Sindi cattle were maintained to provide acclimatized Sindi bulls. In these farms small herds of buffaloes were also graded up

by Murrah (Punjab) bulls. At the Jorhat Farm a herd of Grey Behari and Maurangia cattle was graded up by the use of selected bulls. The attempt to keep a herd of Sindis at Upper Shillong was abandoned at the end of the year, as they did not thrive. The six Assamese cross-breds proved a great success, their average milk-yield per lactation being 2,021.3 lbs., against 867 lbs. of their Assamese mothers during the year. The Murrah buffaloes did well, both at Khanapara and Sylhet, their average milk yield during the year being 4,319.3 lbs., against the average of 1,833 lbs. of the local buffaloes at the Khanapara Farm.

The main interest at the Upper Shillong Farm was in profitable milk production, and the breeding of cattle was planned solely with that object. Excellent results in this direction were obtained by using bulls of foreign breeds, mainly the Friesian. During the year under report, the average lactation yield of twenty-six cows was 5,907 lbs. per cow in 270 days, compared with 4,099 lbs. in 253 days in the previous year. The best lactation yield was over 9,000 lbs.

The bulls maintained at the Government Farms and at the Sylhet Seed Depot were available for public use and served about 450 cows. Forty-five bulls were issued on loan and three were sold.

CENTRAL PROVINCES. The eight cattle-breeding and dairy farms continued to be managed by the Agricultural Department. The Garhi Farm in Balaghat District dealt with the Goalao breed, which is the main work-animal of Nagpur Division, by line-breeding. But, because of the decrease in the demand for bulls, consequent on general depression, the breeding herd was reduced by thirty-five to fifty-six by rigorous selection. The two cattle-breeding farms in Berar, *viz.*, Ellichpur and Bod, passed through a difficult period. At the former a herd of Hansi-Hissar cattle was maintained but owing to the lack of demand for bulls, the herd was reduced during the year. At Bod the stock consisted of local and cross-bred cows sired by pure-bred Hansi-Hissar bulls. There were 390 animals on the farm at the end of 1934-35, and grade breeding and selection were the methods employed. Some live-stock improvement work for the Eastern Circle was carried out at Pakaria in Bilaspur Dis-

trict, where a pure-bred Malva bull was used for grading up the local cows, the object being to evolve a new breed suitable to the food and environmental conditions of the tract. In the Northern Circle there were two main farms—at Powarkheda and Richhai—and a subsidiary farm at Ratona. At Powarkheda and Ratona pure Malvi cows were kept and a policy of rigorous selection was pursued. This is the only herd in the province with any pretensions to being a pedigree herd. The introduction of fresh blood from Malwa made a marked impression on the herd which was suffering from intensive in-breeding. At Richhai half-bred Malvi-Montgomery crosses were mated with cross-bred bulls, the object being to evolve a dual-purpose animal. A marked increase in milk was evident, and it is stated that the males appeared to be suitable as work animals.

In the NORTH-WEST FRONTIER PROVINCE live-stock improvement is dealt with by the Civil Veterinary Department only and a total of 234 subsidy sires including Dhanni, Montgomery and buffalo bulls were at stud at the end of 1933-34 and a total of 14,796 cows were covered. The most popular breed was the Dhanni, and the systematic use of bulls of this breed all over the province appears to have effected marked improvement in the indigenous stock. Systematically controlled breeding, combined with the holding of one-day cattle shows with annual distributions of cash prizes at different centres, had the effect of stimulating and furthering the interests of cattle-breeding in the province, to a very marked extent.

In HYDERABAD STATE cattle-breeding is carried on at the Himayatsagar farm, which is under the control of the Agricultural Department, for the improvement of cattle for plough work suitable for the Telingana tract. Improvement of milk-yield without sacrificing efficiency for field work was also aimed at. On the recommendations of the Animal Husbandry Expert, improvement of cattle was attempted through systematic selection, castration and better feeding in natural breeding tracts. Two breeds of cattle were thus dealt with, *viz.*, the Malvi on the north-eastern corner of the State and the Krishna Valley in the south-eastern area. For

the remaining part of the State, cattle improvement with the Deoni breed was based on the Hingoli stud where a valuable herd of Deoni cattle is being built up under the Civil Veterinary Department for distribution to breeders in the Deoni area.

In TRAVANCORE the cattle breeding farm at Trivandrum was transferred to the Palace with effect from 1934-35. There were 113 animals at the end of the year. Ten stud bulls were maintained and served 190 cows. The Department also maintained stud bulls at the veterinary hospitals at Kottayam and Trivandrum for the use of cattle-owners in the neighbourhood. The Department continued to give grants to private individuals and co-operative societies that maintained breeding bulls for the use of the public. These bulls served in all 910 cows.

In COCHIN there were 140 animals at the end of the year 1934-35, as compared with 133 of the previous year. The number of coverings recorded was 70 in 1934-35 and 52 in 1933-34. A Sindi bull of good milk strain was purchased from the Government Cattle Farm, Hosur, during 1933-34. Ongole bulls are stated to have been found best suited to serve as dual-purpose animals, but it seems probable that a smaller type more suitable to the capacity of the country could be found, e.g., in the Kangayam breed. Grants were given for bulls maintained by private individuals.

In BARODA the number of animals at the Cattle-breeding Farm at Makepura was 110 at the end of 1934-35, as against forty-one of the previous year. To help the general improvement of agricultural cattle, a number of selected bulls were distributed on the premium system.

(b) **Other Animals.** MADRAS. At Hosur there were 144 sheep (Bellary breed) during 1934-35. 207 lbs. 14 oz. of wool was obtained from one shearing, which worked out to an average of 1 lb. 12 oz. per head per shearing. The second shearing was delayed due to bad health of the animals. The highest individual wool-yield in one shearing was 4 lbs. 9 oz. given by a black-face ram.

In 1933-34 two stallions were maintained by the District Board, Coimbatore, for breeding purposes. In 1934-35 one of these, having been found unfit for further breeding work, was auctioned and the

other one transferred to Palayakottai. Fourteen mares were served in 1934-35, as against thirty-three in 1933-34.

BOMBAY. The District Local Board, Ahmednagar, had one stallion at stud at the beginning of 1934-35. It covered nineteen mares, as against twenty-six in 1933-34, and was cast on account of age and has not been replaced. The former horse-breeding operations of the Government have therefore ceased.

SIND. There were three stallions at the end of the year 1934-35. These covered 195 mares, as against 215 in the previous year.

BENGAL. Male goats and a ram were maintained by the Bengal Veterinary College for breeding purposes. The he-goats served 442 females during 1934-35, as against 331 in 1933-34.

UNITED PROVINCES. There were fifty-six stallions on the roll at the end of 1934-35, as against fifty-seven at the end of 1933-34. The coverings performed by them were 1,907 and 1,838 in 1933-34 and 1934-35 respectively. In 1934-35, the average of coverings was 37.5 per animal. There were nine Jack donkeys at the end of 1934-35 and the number of their coverings was 338, making an annual average of 37.6 per animal. The progeny of Government stallions continued to show progress.

PUNJAB. The economic value of sheep and goats was explained to stock-owners by the Veterinary Staff in the course of their tours, and at cattle fairs and shows, the importance of breeding by careful selection and feeding was impressed on sheep-breeders. At the Hissar Farm a fresh flock of Hissar Dale sheep was established from sheep specially selected for wool and mutton production. The Bikaner sheep were divided into two flocks, the black-faced and tan-faced, and breeding by selection and grading was continued. The average quality of wool and outturn of mutton showed improvement. 116 Hissar Dale rams, forty-five ewes and 137 Bikaneri rams were issued and thirty-five male and two female goats were supplied for breeding.

The number of horse and pony stallions at service in the non-selected districts of the province was eighty in 1934-35 and seventy-seven in the previous year, and the number of donkey stallions was eighty-six in 1934-35 and eighty-two in 1933-34. The number

of mares covered by horse and donkey stallions was 4,715 and 5,226 in 1934-35 and 4,284 and 4,736 in 1933-34. The question of the improvement of donkey breeding as pack animals continued to engage the attention of the Veterinary Department.

Ten selected camel stallions were issued by the District Board, Ferozepur, and the number of their coverings was 566 in 1934-35 and 516 in 1933-34. Certain other District Boards were induced to take interest in the improvement of camel breeding, particularly in dry, arid and remote tracts, where such animals have a special economic, domestic and commercial value. A flock of pure-bred Jamna-pari goats was systematically bred at the Hissar farm for increased milk production and much improved yields were observed.

NORTH-WEST FRONTIER PROVINCE. Horse and donkey breeding was continued, while the breeding of Merino sheep in the Kaghan Valley was under consideration. Sixteen horses and one pony covered 614 and thirty-six mares in 1933-34; the average number of mares covered by horse stallions increased from 33.3 in 1932-33 to 38.3 in 1933-34. There were sixteen donkey stallions at stud during 1933-34. The average number of mares covered by them was 43.5 in 1933-34 as against 42.6 of the previous year.

In 1934-35, fourteen horses and one pony covered 592 and forty-four mares respectively. At the close of the year there were fifteen donkey stallions which covered 675 mares.

For improving sheep of the province, particularly in the matter of quality of wool, twenty Hissar Dale rams and fifteen ewes were imported from the Hissar Farm and distributed amongst breeders in the Kaghan Valley of Hazara District.

HYDERABAD. The experimental breeding of Bikaner sheep was continued at Hingoli and the results were satisfactory, both as regards health and wool-production.

(c) **Poultry.** **MADRAS.** Flocks of White Leghorns, Rhode Island Reds, Light Sussex, Black Minorcas, Chittagongs and Country (Tellicherry) fowls were maintained at Hosur. Trap nesting was continued. White Leghorns and Black Minorcas laid the maximum number of eggs in the pullet year, 215 and 214 respectively. In

addition to those maintained at Hosur, flocks of some of the more important breeds of poultry were maintained at other research stations.

BOMBAY. At the Central Poultry Farm, Kirkee, the following poultry were imported during 1933-34 and their progeny proved to be very satisfactory.

Two White Leghorn cocks and two hens.

Three Rhode Island Red cocks and three hens.

One Australorp cock.

One White Wyandotte cock and one hen.

The use of mineral mixtures and the adoption of scientific methods of feeding was taken up and the results were published in the Departmental Experimental Records. There were 550 birds in 1933-34 and 675 in 1934-35 at the Farm. The number of stud cocks put out during the years 1933-34 and 1934-35 were 120 and 192 respectively. The average hatching percentage was 74.7. The cost of incubation worked out to ten pies per chicken hatched. Six students were given a short course in poultry management at the Farm during 1934-35. The Bombay Presidency Poultry Association and certain American Missions took an active interest in poultry breeding.

BENGAL. There was marked improvement of stock both by selection of the two pure-bred races kept, *viz.*, the imported Rhode Island Reds and the local Chittagongs, and by crossing the two breeds. This work commenced in 1927 and the average number of eggs laid by the Rhode Island Reds had been raised from fifty per annum to 132, the Chittagongs from sixty to ninety-five, while the average of the fifth cross between the two breeds was 125 eggs per annum. The cross-bred was a good table bird and an active forager and the average weight of egg was 2 oz. Due to demonstration of the crosses in the villages, there was an increased demand for stock and eggs.

PUNJAB. Research on poultry-breeding at the Gurdaspur Poultry Farm was directed largely to the improvement of the indigenous fowl by selection and breeding rather than by the introduction of foreign stock. Work on the production of standardised

indigenous strains was continued. The new strain of buff-coloured *desi* fowl reached the fifth generation during 1934-35. Another black type was selected as promising and gave evidence of becoming fixed more quickly than the previous strain. Improved types of cocks were sent to Jullundur and Rawalpindi for use in the poultry sections of those farms.

Prominent foreign breeds of fowls were maintained at the Poultry Farm, Gurdaspur for the supply of eggs and young stock to those who required them for breeding purposes.

Courses of instruction in poultry keeping was given at Gurdaspur and at Rawalpindi and a class for Agricultural Assistants employed on district work was conducted.

BIHAR AND ORISSA. Small flocks of White Leghorns were established at Kanke, Patna and Cuttack, the largest flock being at the Kanke Farm where excellent results were obtained from controlled breeding and scientific management.

ASSAM. Stocks of poultry, especially white Leghorns, were kept at Upper Shillong, Khanapara, Sylhet and Titabar farms for crossing with local hens. As the Leghorns \times local crosses were not in demand, steps were taken to keep only birds of pure imported breeds.

HYDERABAD. The breeds of fowls kept at Himayatsagar were White Leghorn, Rhode Island Reds, Australorp and Hyderabad Asil (Noori strain). The Rhode Island Reds did better than the other breeds. With the increase of interest in poultry-keeping, the demand for pure-bred stock increased and sixty-six adult birds of pure breeds were sold during 1934-35. Experiment at selection of country fowls was continued. A small poultry farm was started at Parbhani in 1933-34 and work was concentrated on the Rhode Island Red breed.

TRAVANCORE. The Department introduced birds of superior breeds from other countries. A small farm at Pettah in Trivandrum was maintained to acclimatize imported birds and multiply them for distribution to the public. White Leghorn, White Wyandotte and Rhode Island Reds were all found to adapt themselves to Travancore conditions, but the first-named were the most popular.

AGRICULTURE & ANIMAL HUSBANDRY IN INDIA, 1933-35. Part II. ANIMAL HUSBANDRY.

PLATE III.



1. Kangra District Sheep and Goats.



2. A typical Small Holder in the Kangra District.

(Reproduced from the Annual Report of the Civil Veterinary Department, Punjab, for 1933-34.)

During 1934-35 two sub-stations were opened, one at each of the Agricultural Schools.

5. Dairying. The Provincial Economic Conference, 1934, agreed to the proposal put forward by the Animal Husbandry Expert to the Imperial Council of Agricultural Research that the Imperial Institute of Animal Husbandry and Dairying, Bangalore, should be supplemented by the provision of a model creamery with facilities for industrial research and also for carrying out research on the physical and chemical properties of Indian milk and its reactions to various forms of processing and transport under Indian conditions. As a result of this recommendation, the Government of India sanctioned a sum of Rs. 6 lakhs, spread over a period of five years, for the expansion of the existing Imperial Institute of Animal Husbandry and Dairying at Bangalore and to establish an experimental creamery at Anand, Gujarat, Bombay Presidency.

With the appointment of an Agricultural Marketing Adviser, with special marketing officers for dairying, a further stimulus was given to the industry.

Selective breeding of indigenous breeds of cattle with milking capabilities, *viz.* the Hariana and the Tharparkar breeds and Murra buffaloes at the Imperial Cattle Breeding Farm, Karnal, and the Sindi and Gir breeds and Murrah buffaloes at the Imperial Dairy Institute, Bangalore, was continued and all these breeds showed improvement in type, conformation and performance. Systematic testing of their milk for fat and solids-not-fat was continued. Feeding experiments were conducted in co-operation with the Physiological Chemist and other items of investigation were carried out at these farms.

At the Imperial Institute of Agricultural Research, Pusa, experiments on a system of pre-milking and handling of the Pusa Pedigree Sahiwal, combined with frequent milking of cows, was continued, but an outbreak of foot-and-mouth disease in the herd interfered with results. Inspite of this setback, the average yield per cow per day while in milk rose from 18.7 in 1933-34 to 19.1 lb. in 1934-35. There was also an increase in the average length of lactation. The milk-yield in certain cases was as much as 8,000

lbs. Data were collected of weights and body measurements of these animals in order to find out a normal growth-standard. These data should be of value in showing how the stock react to the special system of management adopted at this farm in comparison with similar data collected at other farms.

The dairy attached to the Imperial Institute of Veterinary Research, MUKTESAR, showed improvement, the average daily milk-yield per cow having been raised from 14.6 lbs. in 1932-33 to 18.08 lbs. in 1934-35, by scientifically controlled feeding and management, particularly in the matter of mineral feeding.

MADRAS. The Sindi herd at Hosur continued to do well, the daily average yield per cow in milk was 12.9 lbs. Of the 32.3 cross-bred cows at the Agricultural College Dairy, Coimbatore, an average of 22.3 were in milk, and yielded 14.4 lbs. of milk per day per cow in milk. Taking the average of the whole herd, the yield per day was ten lbs.

BOMBAY. In order to obviate as far as possible the very unsatisfactory methods which are employed to obtain milk supply for Bombay City, the Local Government set apart 1,054 acres of land at Palghar to be leased at concessional rates for dairying purposes. It is hoped that by this means dairymen of Bombay may be induced to make a start in establishing a new dairy area for the supply of milk to the city.

SIND. The daily milking average of the Red Karachi herd at the Fruit Farm, Mirpur Khas, was 12.7 lbs., as compared with 11.2 lbs. of the previous year. The highest milking average went to 14.7 lbs. per day. The best lactation went up to 5,000 lbs. milk in a period of 300 days.

BENGAL. The daily average milk-yields of Sindi, Hariana, Cross-bred cows and Murrah buffaloes maintained at the Dacca Farm was 8.18, 7.34, 9.59 and 13.92 respectively in 1934-35. The students of the Agricultural School and Demonstrators from the Northern Circle were given training in dairying.

UNITED PROVINCES. In milk production the indigenous breeds showed great possibilities. That the Hissar has high milking capacity was clear from the number of cows already produced in

the Department's herd yielding 6,000 lbs. and over of milk per lactation.

PUNJAB. A milk recording section is maintained at the Hissar Cattle Farm with a view to segregating out good milch strains without disturbing the draught qualities of the breed. These cows are not regularly maintained under strict dairying conditions and in the circumstances could not compete with those of the Montgomery breed as recorded in the grantee farms of the district, where yields of 4,000 to 5,000 lbs. of milk were common. At the Hissar Cattle Farm the average yield was just over 3,000 lbs.

The wide scope which exists for improving milk yield was shown by the Lyallpur College Dairy, where over a period of twenty-one years the over-all-dry and milking periods increased and average yield of its small herd has been increased by severe culling and scientific feeding and management from 5.6 lbs. to 16.3 lbs., while at the Military Dairy Farm, Ferozepur, the over-all yield from Sahiwal cows had been raised in about twenty-five years from 5.5 lbs. per day to seventeen lbs. One cow in this herd gave 8,829 lbs. of milk in a lactation period and several have given yields of over 10,000 with an average of 4.6 per cent. butter-fat. Much improved yields were also recorded at the Jehangirabad Cattle Farm and other grantee cattle-breeding farms. These yields compare well with the yields of commercial dairy cattle in other countries which have been subjected to systematic selection and scientific feeding and management for far longer periods of time.

BIHAR AND ORISSA. At the Patna Cattle-breeding Farm the average over-all milk yield per cow increased from 9 lbs. in 1933-34 to 9.8 lbs. in 1934-35. The average over-all milk yield of the country cows at this farm was 7.6 lbs. per head per day and that of the Tharparkar cows was 11.2. The average milk yield per cow per day while in milk from the pure-bred Sahiwal and Tharparkar cattle maintained at the Kanke Farm under the Department of Agriculture was 19.4 lbs.

CENTRAL PROVINCES. In the Telinkheri Dairy Farm in Nagpur, which is under the control of the Agricultural Department, the herds consisted of Sahiwal cows and pure-bred Murrah buffaloes.

Due to proper breeding, feeding and selection, the milk-yield per head increased from 946 lbs. per annum in 1919-20 to 2,678 lbs. in 1934-35. Out of the twenty-nine home-bred stock which completed their lactation in 1933-34, eight gave more than 4,000 lbs., nine between 2,000 and 3,000 lbs. and five below 2,000 lbs.

ASSAM. At the Khanapara Farm the Sindi × Assamese cow showed a milking capacity of ten to twelve lbs. a day, compared to the four lbs. of the Assamese dams. At the Upper Shillong Farm the average lactation of the cows in the European cross-bred herd was 4,099 lbs. in 253 days, the best being 6,765 lbs. by a Friesian × Hariana cross.

HYDERABAD. At the Cattle Breeding Farm at Himayatsagar an up-to-date dairy furnished with pasteurising plant is in existence to demonstrate modern methods of dairying. In addition to the herd of cows, a small herd of Murrah buffaloes was maintained to supplement the supply of milk for the dairy.

CHAPTER II.

VETERINARY AND ANIMAL HUSBANDRY RESEARCH.

1. Animal Health.

The reports of the Veterinary Disease Investigation Officers in the provinces, appointed under a grant from the Imperial Council of Agricultural Research, furnished a great deal of valuable information as to diseases of stock throughout India and the value of this work is now well recognised.

For the prevention and control of animal diseases by means of suitable all-India legislation, a draft bill and model rules were prepared by the Imperial Council of Agricultural Research. These were approved by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry and by the Advisory Board of the Imperial Council of Agricultural Research and are now under the consideration of the Government of India.

During the period under review, two new methods of rinderpest control, by means of a fixed goat-virus, which has resulted from research carried on for many years at the Imperial Institute of Veterinary Research, Muktesar, were under systematic field investigation in most provinces and in certain Indian States.

Many thousands of inoculations were made under controlled conditions. In some cases immunization was undertaken for the control of actual outbreaks of the disease; in others as a means of conferring lasting immunity, with a view to reducing the numbers susceptible in areas particularly exposed to infection, and in others to immunize specially valuable animals. The virus employed in both cases is a virus which has been carried on continuously at the Imperial Institute of Veterinary Research, Muktesar, for a number of years, by repeated passage through goats. Its virulence for the ox is considerably reduced, but it appears to be fixed at a high level for the goat.

Two methods of employing the fixed goat-virus as a vaccine have been under trial.—(a) a method usually referred to as the

tissue-virus method, first produced in the Serological Section of the Muktesar Institute, in which spleen tissue is ampouled under aseptic conditions and held in cold store, ready for immediate use where and whenever required, and (b) the method, usually referred to as the 'goat-virus' method, which was first used in the Central Provinces by the late Major Stirling, in which the blood of goats inoculated with the Muktesar strain of fixed goat-virus is used. Suitable goats are purchased in the locality where inoculations are to be carried out and injected on the spot.

Both methods have been subjected to very extensive field trials in all parts of India by Disease Investigation Officers and others, and it is now clear that a very great step forward has been made in regard to the systematic control of rinderpest in India.

Both methods are easy to apply, provided that the requisite trained staff is available to carry out inoculation on a sufficient scale, and very cheap compared with the heavy expenditure involved in the use of anti-rinderpest serum, either alone or for the serum-simultaneous method of protection. Where blood virus is used, an average of about 500 doses is obtained from each reacting goat and as many as 2,500 or more doses of tissue-virus may be obtained from a spleen of moderate size.

The cost per dose is thus extremely low and it seems certain that some such method will, in future, be almost exclusively employed, throughout India, for the control of rinderpest among indigenous 'plains' cattle. It only remains to determine which method is the better suited to the conditions obtaining in the various provinces and States concerned.

In Bengal, in particular, the 'tissue-virus' method has been very extensively employed for the control of actual outbreaks of rinderpest among the cattle of the Province, and the results have been highly successful. In the Central Provinces and in certain other provinces and States, the 'goat-virus' (blood) method has so far been mainly employed.

The main difference between the two methods is that in the 'tissue-virus' method the vaccine is periodically prepared in a provincial laboratory, and kept ready for immediate use, only

requiring to be emulsified in saline solution before administration. In the case of the 'goat-virus' method, goats have to be inoculated in the field with fixed virus and, if they react satisfactorily, are bled at the height of their reaction.

Some days' delay is thus involved in the goat (blood) virus method which might be of importance in dealing with actual outbreaks, but this method can be very successfully employed for the immunization of healthy animals. The mortality among the inoculated has, in both cases, been very small, amounting to only a fraction of one per cent. even where actual outbreaks of rinderpest have been controlled by the immediate inoculation, with tissue virus, of all surviving animals; a number of which must certainly have been in the incubative stage at the time of inoculation.

- Important points in favour of these methods of protection with goat-virus are that :—

- (a) it appears that abortion is seldom caused even when cows approaching parturition are inoculated;
- (b) loss of condition and milk are usually much less than from a severe re-action in the course of serum-simultaneous inoculation with bull virus. In fact, such loss of condition or milk as has occurred appear to have been mainly due to the animals having been worked while passing through their re-action to the vaccine;
- (c) for indigenous cattle, there appears to be no necessity for the careful graduation of the dose, which was necessary when serum was used for the serum- simultaneous method of protection, with bull virus.

Other diseases. Nasal Granuloma (*Nasal Schistosomiasis*) is another important disease of cattle for which an effective method of control was developed during the period under review, as a result of the observations as to the cause of this condition which were made in the autumn of 1931 by Captain S. C. A. Datta of the Imperial Institute of Veterinary Research, Muktesar, and sent for publication on 2nd April, 1932. The life-history of *Schistosoma nasalis*, which has now been shown to be the specific cause of this

tissue-virus method, first produced in the Serological Section of the Muktesar Institute, in which spleen tissue is ampouled under aseptic conditions and held in cold store, ready for immediate use where and whenever required, and (b) the method, usually referred to as the 'goat-virus' method, which was first used in the Central Provinces by the late Major Stirling, in which the blood of goats inoculated with the Muktesar strain of fixed goat-virus is used. Suitable goats are purchased in the locality where inoculations are to be carried out and injected on the spot.

Both methods have been subjected to very extensive field trials in all parts of India by Disease Investigation Officers and others, and it is now clear that a very great step forward has been made in regard to the systematic control of rinderpest in India.

Both methods are easy to apply, provided that the requisite trained staff is available to carry out inoculation on a sufficient scale, and very cheap compared with the heavy expenditure involved in the use of anti-rinderpest serum, either alone or for the serum-simultaneous method of protection. Where blood virus is used, an average of about 500 doses is obtained from each reacting goat and as many as 2,500 or more doses of tissue-virus may be obtained from a spleen of moderate size.

The cost per dose is thus extremely low and it seems certain that some such method will, in future, be almost exclusively employed, throughout India, for the control of rinderpest among indigenous 'plains' cattle. It only remains to determine which method is the better suited to the conditions obtaining in the various provinces and States concerned.

In Bengal, in particular, the 'tissue-virus' method has been very extensively employed for the control of actual outbreaks of rinderpest among the cattle of the Province, and the results have been highly successful. In the Central Provinces and in certain other provinces and States, the 'goat-virus' (blood) method has so far been mainly employed.

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- (b) loss of condition and milk are usually much less than from a severe re-action in the course of serum-simultaneous inoculation with bull virus. In fact, such loss of condition or milk as has occurred appear to have been mainly due to the animals having been worked while passing through their re-action to the vaccine;
- (c) for indigenous cattle, there appears to be no necessity for the careful graduation of the dose, which was necessary when serum was used for the serum-simultaneous method of protection, with bull virus.

Other diseases. Nasal Granuloma (*Nasal Schistosomiasis*) is another important disease of cattle for which an effective method of control was developed during the period under review, as a result of the observations as to the cause of this condition which were made in the autumn of 1931 by Captain S. C. A. Datta of the Imperial Institute of Veterinary Research, Muktesar, and sent for publication on 2nd April, 1932. The life-history of *Schistosoma nasalis*, which has now been shown to be the specific cause of this

condition, was also studied by research workers at the Madras Veterinary College and prevention has thereby been greatly facilitated. In the past this condition has in many parts of India been the cause of heavy mortality, particularly amongst working bullocks, and its effective control is a matter of considerable economic importance to the cattle-owners of large sections of India.

An important finding in regard to this condition was that on examination of large numbers of buffaloes, which usually do not show any well-marked clinical symptoms, thirty-nine per cent. were found to be affected. The importance of this observation is obvious in view of the habit of buffaloes to wallow for hours in tanks in which village cattle are watered.

In Madras schistosomiasis was recorded as one of the likely causes of dysentery in the dog in this country.

In the Punjab, in addition to the extensive field observations which were made by the Disease Investigation Officers as to the efficacy and practicability of the goat-tissue vaccine as a method of protection against rinderpest, equine encephalomyelitis was investigated at the Punjab Veterinary College and a scheme of research was in progress, financed by the Imperial Council of Agricultural Research, to study the effects of the quality of the food consumed on the resistance of calves and sheep to parasitic infestation.

Much time was also given to the study of the canine fevers of obscure origin, which are very fatal to dogs in North India, while the preparation of a suitable vaccine against rabies (after the method of Remlinger and Bailly) was attempted, with very encouraging experimental results. It is hoped that this vaccine will shortly be available to the public.

The efficacy of Naganol (Bayer 205) administered intravenously for the curative treatment of surra in equines was further established by experimentation on an extensive scale in the United Provinces. An outbreak of fatal Bovine Surra occurred at the Imperial Cattle Farm at Karnal, in which brain symptoms were prominent, but Bayer 205 was found to be an efficient therapeutic and prophylactic agent for the control of this condition.

In Bihar and Orissa extensive field investigations were carried out by the Disease Investigation Officer in the treatment of Fluke disease by means of Carbon Tetrachloride and very satisfactory results were obtained. Large numbers of cases were systematically treated with full doses and no untoward results were noted. In the course of this work it was demonstrated that in certain areas Bilharziasis is extremely prevalent amongst cattle.

At the Patna Veterinary College research work on the etiology of *Kumri* was continued, special attention being paid to the study of the histo-pathology of the nervous system in the disease.

At the Bengal Veterinary College some observations were made on endemic Haematuria of cattle and a brochure was published in which a hypothesis was put forward that *kumri*, osteo-porosis and non-sweating are manifestations of one and the same disease complex. Investigation of bovine haematuria was conducted at the Muktesar Institute.

Recent experimental work on congenital blindness in calves (*Amaurosis*) at Muktesar definitely confirmed the opinion that a Vitamin A deficient diet could produce this condition and its incidence, which in the past was very high at certain Farms, has now been reduced to negligible proportions by proper feeding.

Experimental treatment to test the value of colloidal iodine as a vermicide made in the United Provinces showed that the drug had great possibilities as an efficient poultry anthelmintic.

A considerable amount of research was carried out by the Burma Veterinary Department on Avian Distemper.

2. Animal Nutrition.

The Animal Nutrition Section at BANGALORE continued to carry on valuable research on the nutrition of Indian cattle and on the composition of Indian food-stuffs. The mineral composition of four fodders, viz., Rhodes grass hay (2) Aurangabad hay (3) Spear grass hay, and (4) *Juar* hay, at different stages of maturity was determined and the assimilation of minerals from these fodders was studied. Four typical fodders at different stages of maturity were fed to cattle and the acid base balance of the resulting urine

was studied. The species of grass and the stage of maturity both profoundly influenced the mineral supply to and the acid-base balance in the animal.

A long period feeding test was carried out with sheep. It was found that the live-weights fluctuated roughly in accordance with food consumption, but that individual animals differed considerably in their efficiency as regards utilization of food. Digestion experiments indicated that the food varied somewhat in quality and that consumption increased when the quality improved. The extent of such increased consumption was considerable. With regard to wool-yield, it was observed that the yields fluctuated according to the nutritional state of the animal.

A new method was devised for the determination of sulphur in vegetable and animal products for use in sulphur-balance experiments in cattle and sheep. The chief advantage of this method is that a larger amount of material can be used for determinations and this, in turn, makes it possible to determine the sulphur intake and output with precision.

In MADRAS experiments on the feeding of sulphur to sheep did not result in significant increase in the quantity or quality of wool. A survey of Malabar pastures in respect of mineral matter showed that uplands were deficient in phosphoric acid and lime as compared with forest grazing areas, and it was found that Trichinopoly phosphate with sulphur, molasses and bran formed a suitable mineral mixture for cattle to make good the phosphorus deficiency in the ration.

In BENGAL it was demonstrated that paddy straw alone was not a maintenance ration and that cattle fed continuously on this alone must eventually die and that the addition to the diet of even a small quantity of protein, in the shape of linseed cake, balanced the ration and life was maintained. It was found that *aus* (autumn) paddy straw was of a much higher value as fodder than *aman* (winter) paddy straw and experiments at Dacca showed that *aus* paddy straw makes excellent silage. The Agricultural Chemist, Bengal, worked out a new procedure for the direct computation of individual digestibilities of a mixed feed. The method obviates the necessity of

conducting separate digestion tests, first with a single feed followed by combined feeds, and seems to mark a distinct advance in method.

At the Agricultural College, LYALLPUR, experiments carried out to ascertain the comparative feeding values of fuzzy and naked cotton seeds proved that there was no scientific basis for the prejudice prevalent amongst zamindars against the use of fuzzy cotton seed as cattle food. In spite of its fuzzy nature, 43F cotton seed proved to be a better feed than the comparatively naked 4F variety.

Digestibility trials were conducted with two-year old silage oats and maize with a view to study the extent to which storage over long periods affects its nutritive qualities. Silage two years old was found to be a maintenance ration for full-grown heifers, and green guarra (*Cyamopsis psoraliooides*) with green sunflower (*Helianthus annuus*) was found to be a rich maintenance ration for full-grown heifers.

In the Agricultural College, NAGPUR, research work on the nutritive value of the common grasses was completed and the results published.

At the PUNJAB Veterinary College, experiments to determine whether certain mineral deficiencies tend to lower animal resistance towards parasitic infestation were started from September 1934, under a Parasitological Scheme financed by the Imperial Council of Agricultural Research, and the results so far obtained indicate that these observations may be of considerable economic importance.

CHAPTER III.

VETERINARY EDUCATION AND OTHER COURSES.

1. Veterinary Colleges.

The provision for veterinary education in India continued to be incomplete, in that no provision exists yet for full course of training in Veterinary Science such as would secure international recognition and equip young Indians for direct appointment to the superior provincial veterinary services, which were created some years ago to take the place of the Indian Veterinary Service, recruitment to which was stopped in 1924. A certain number of Indians obtained the M.R.C.V.S. qualification during the period under review, but owing to the very poor remuneration and prospects which were offered to several of these young men on their return to India, after at least five years' veterinary training, Indians have practically ceased to seek admission to the Veterinary Colleges in the United Kingdom. No course of veterinary training at any Indian Veterinary College is recognised internationally as a full veterinary course and steps will have to be taken to provide such a course, if India wishes to carry on international trade in live-stock, or certain live-stock products, or to enter into international conventions with more advanced countries for the control of disease.

The recommendations of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in regard to a suitable uniform curriculum for all Veterinary Colleges in India were referred to the Advisory Board of the Imperial Council of Agricultural Research, and the following proposals were adopted :—

1. A three years' course of veterinary training with the Intermediate Science (Medical group) as the minimum educational qualification should be given at all Indian Veterinary Colleges.

2. A four years' course, from Intermediate Science, should be adopted in each veterinary college when conditions permit. The Board cordially approved of the fact that a four-year course is already given at the Punjab Veterinary College and agreed that no recommendation should be made regarding the curriculum at that college.

These recommendations, with the draft curriculum, were approved by the Government of India and recommended to the provinces concerned.

PUNJAB VETERINARY COLLEGE. There was a falling off in the number of applicants seeking admission to the four years' course which leads to the Diploma of Licensed Veterinary Practitioners. All the students who passed from the Colleges during 1932-33 and 1933-34 were absorbed in the Department, and it is hoped that those who have qualified in the session 1934-35 will also be absorbed.

The usual course of training for syces was continued. A Dressers' class was held as usual, at which four candidates in 1933-34 and two in 1934-35 underwent training. The Farriers' class was popular, the admissions during 1933-34 and 1934-35 being twenty-nine and fifteen respectively.

BOMBAY VETERINARY COLLEGE. The three years' course was continued. Twenty-one were admitted in class A during 1933-34 and forty-seven during 1934-35. The number of students on the rolls was ninety-three at the end of the period under review. Out of seventy-four students passed from the college during the years 1932 to 1934, forty-three were in the service of Government or Local Boards and twenty-one in the service of States.

MADRAS VETERINARY COLLEGE. The three years' course from Matriculation was continued in accordance with the revised curriculum introduced in 1930, and the subjects taught were similar to those approved by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry. The number of students admitted to the College was twenty-nine and twenty-seven in the years 1933-34 and 1934-35. The total strength of the College was 107 and 117 respectively in 1933-34 and 1934-35, as against 118 in

1932-33. In all fifty-six students passed out of the College during the period under review. The Madras Government have agreed to the introduction of a B.V. Sc. degree course, subject to the recognition of the College by the University.

BENGAL VETERINARY COLLEGE. During the last few years there was an increasing demand for admission into this College from provinces and States in India and also from countries outside India, such as Ceylon, Malay States and Iraq. The number of students on the rolls during the years 1933-34 and 1934-35 was 184 and 170 respectively, as against 176 during the year 1932-33. Sixty-three were admitted in 1933-34 and seventy in 1934-35, while the total number graduated during the period under review was ninety-six.

In addition to the ordinary three-year graduate course, a vocational course was held during the period under review and twelve soldiers from the Military Department attended it.

PATNA VETERINARY COLLEGE. In 1933-34 twenty-four new students joined the College and twenty-five in 1934-35. Altogether nineteen students took their diplomas from the College during the period under review.

INSEIN VETERINARY COLLEGE. The School at Insein was reopened as a Veterinary College on the 6th November 1933 for a course of veterinary training of one year's duration to students who wished to qualify for the new grade of veterinary assistants. Of the twenty-five students who commenced the course, seventeen passed the final examination and were appointed to existing vacancies in the subordinate grade. The second batch of thirteen students commenced the course on the 2nd January 1935.

2. Indian Dairy Diploma.

IMPERIAL INSTITUTE OF AGRICULTURAL RESEARCH, PUSA. Nineteen students sat for the Indian Dairy Diploma examination held at Bangalore in the last week of November 1933, of whom fifteen qualified for the award of the Diploma and a new class with twenty-one students was opened in October 1933. No admissions were made during 1934, since admissions are made alternately at Bangalore and at the Allahabad Agricultural Institute.

During 1933-35 the ALLAHABAD AGRICULTURAL INSTITUTE conducted classes for the Indian Dairy Diploma Course. The course lasts two years and a half and is controlled by the Imperial Department of Agriculture. The number of students on the roll for this course was fourteen during 1933-34 and sixteen during 1934-35, of whom six and five students respectively passed the final examinations during the two years under review.

3. Post-graduate Courses.

The annual post-graduate refresher course at the Imperial Institute of Veterinary Research, Muktesar, continued as usual. During 1933-34, ten officers attended the course, of whom the three Disease Investigation Officers continued at the Institute for a further period of three months' training. During 1934-35, nine officers attended the course, of whom one remained to complete the balance of two years' training for which he was deputed to the Institute by the Punjab Government. In addition, five officers each during 1933-34 and 1934-35 attended the short courses of practical training at the Institute. Two other officers received training for varying periods during the years under review.

During 1933-34 and 1934-35, nineteen and thirty-nine veterinary assistants respectively from the district staff of the department attended the six weeks' refresher course at the Punjab Veterinary College. In addition 104 members of the district veterinary staff attended during the year 1934-35 a short course of five days' duration in the practice of Goat-virus vaccination. Special training in the treatment of surra was also given to Veterinary Assistants employed on district work. Two Veterinary Assistants in 1933-34 and three in 1934-35 availed of this course.

A refresher course was held at the Madras Veterinary College during the period under review. Twelve Veterinary Assistant Surgeons, one private student from the Federated Malay States, two Veterinary Inspectors deputed by H. E. H. the Nizam's Government and one private Veterinary graduate attended the refresher course. The course was extended from six to nine months with effect from July 1935.

Six officers attended the post-graduate course of six months' duration at the Patna Veterinary College in 1933-34. This course was suspended during 1934-35.

A refresher course for veterinary inspectors was held at the Insein Veterinary College from 1st December 1934 to 28th February 1935. Four veterinary inspectors availed of it.

IMPERIAL INSTITUTE OF AGRICULTURAL RESEARCH, PUSA. Three post-graduate students were admitted to the fifteen-month course in Animal Husbandry, Animal Nutrition and Dairying, beginning on 2nd January 1934. This course is divided between Bangalore, Karnal and Pusa. The course was completed by the three students in April 1935. Of the two students admitted in the new session beginning on the 2nd January 1935, one left for Scotland for higher studies.

CHAPTER IV.

RECEIPTS AND EXPENDITURE OF THE AGRICULTURAL AND VETERINARY DEPARTMENTS.

The financial aspects of the Agricultural and Veterinary Departments of the Imperial and the Provincial Governments during the three years 1932-33 to 1934-35 are summarised in the Statements I and II appended to this chapter. It may be mentioned that the expenditure of the Agricultural Departments in the Provinces and States includes the expenditure on animal husbandry also, except in the Punjab where it is borne by the Civil Veterinary Department. Statement III shows the expenditure on animal husbandry in the various Provinces and States during 1933-34 and 1934-35.

2. Financial stringency was responsible to a great extent in circumscribing the activities of the various Agricultural and Veterinary Departments in the provinces. In Burma, for instance, the teaching side at the Agricultural College at Mandalay had to be closed down ; the establishment of the Dacca Agricultural Institute was again postponed ; the post of the Live-stock Officer in the Punjab continued to be held in abeyance. Valuable research work was, however, carried out and in some cases initiated as a result of the grants made by the Imperial Council of Agricultural Research and the Indian Central Cotton Committee, and the assistance of these two bodies has been generously acknowledged in the various departmental reports of the provinces.

STATEMENT I.

*Receipts and Expenditure of the Agricultural Departments in India
for the years 1933-34 and 1934-35.*

	1932-33		1933-34		1934-35	
	Receipts	Expenditure	Receipts	Expenditure	Receipts	Expenditure
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Imperial Department of Agriculture.	2,84,416	9,00,500	2,24,515	8,80,076	2,02,106	9,08,471
Madras*	2,02,372	16,93,214	1,86,065	17,45,928	1,82,436	18,44,841
Bombay Presidency (Proper)	2,15,975	11,22,464	1,81,916	10,83,430	2,10,731	10,86,257
Sind	11,018	4,04,975	52,364	3,96,140	53,044	5,18,351
Bengal	91,235	9,00,970	77,271	11,11,848	86,672	9,35,000
United Provinces	8,47,713	18,67,591	3,26,995	19,43,770	3,03,990	19,89,495
Punjab	4,56,206	18,17,637	5,47,689	21,50,006	5,93,168	22,16,122
Burma	1,05,233	7,75,829	1,00,758	8,55,858	1,46,866	8,15,236
(a)					(c)	(b)
Bihar and Orissa	1,02,438	5,36,558	1,10,494	5,55,819	1,13,054	5,67,308
Central Provinces	2,88,312	8,94,175	2,80,909	9,47,938	2,85,174	9,83,185
(e)			(d)			
Assam	65,745	4,00,549	56,559	3,91,563	58,479	3,97,786
North-West Frontier Province	30,824	72,447	38,708	1,02,605	51,947	1,00,000
Baluchistan	3,266	16,231	3,274	33,208	3,701	41,452
TOTAL	22,04,753	1,14,21,239	21,37,517	1,22,07,789	23,01,368	1,24,58,094

Indian States.

Hyderabad	.	.	.	.	..	34,305	9,32,400	35,000	9,18,000
Mysore	.	.	.	.	..	1,60,253	5,69,824	1,55,967	5,46,960
Travancore	.	.	.	.	..	14,717	1,37,378	17,530	1,43,429
Baroda	.	.	.	.	..	37,266	2,12,599	39,557	2,00,625
Cochin	.	.	.	.	..	15,804	86,081	17,337	90,080
Bhopal	.	.	.	.	..	(f)1,752	(f)88,732	(f)2,847	(f)32,613
TOTAL	.	..			2,73,097	19,77,014	2,67,738	19,31,707	

* The figures do not include the schemes financed by the Imperial Council of Agricultural Research and the I. C. C. C. and expenditure on stores purchased in England.

† Includes the expenditure incurred on engineering and agricultural propaganda schemes financed by Central Government.

(a) Includes Rs. 8,014 contributed by the I. C. C. C.

(b) Does not include "charges in England" but includes expenditure on account of "Botanical and other Public Gardens," which is not the expenditure of the Agricultural Department proper.

(c) Includes Rs. 10,080 contributed by the I. C. C. C. and Rs. 50,000 by the I. C. A. R.

(d) This includes the grant of Rs. 81,196 contributed by the I. C. C. C. and the I. C. A. R.

(e) This includes the grant of Rs. 1,05,622 contributed by the I. C. C. C. and the I. C. A. R.

(f) Including the Departments of Agriculture and State Laboratory, Meteorological Department and Taxidermy Section.

STATEMENT II.

Receipts and Expenditure of the Veterinary Departments in India for the years 1933-34 and 1934-35.

	1932-33		1933-34		1934-35	
	Receipts	Expenditure	Receipts	Expenditure	Receipts	Expenditure
•	Rs.	Rs	Rs.	Rs.	Rs.	Rs
Madras	45,292	8,90,304	45,031	9,04,392	47,079	9,31,737
Bombay Presidency (Proper) .	17,005	4,90,407	14,342	4,69,486	17,860	4,74,893
Sind . . . . .	..	1,18,534	..	1,05,481	..	1,06,463
Bengal	84,869	2,17,669	1,43,615	4,83,602	1,28,437	4,69,114
United Provinces	1,37,866	4,58,047	1,26,381	4,14,918	1,20,226	4,12,101
Punjab	1,49,225	18,27,591	1,48,246	18,93,252	1,27,897	19,80,505
Burma	20,070	5,56,351	21,738	4,70,744	23,009	4,10,941
Bihar and Orissa	1,24,043	3,90,576	1,12,801	6,73,871	1,21,040	6,68,694
Central Provinces	1,605	3,80,419	..	3,74,832	..	3,03,940
Assam	1,114	1,73,737	1,548	1,60,281	1,188	1,79,442
North-West Frontier Province .	..	80,156	..	1,15,128	..	1,15,981
Imperial Institute of Veterinary Research, Muktesar and its sub-station, Izatnagar.	9,22,805	6,34,456	5,96,602	6,38,565	5,78,725	6,41,690
TOTAL .	15,09,011	62,36,337	12,11,204	67,22,552	11,71,479	68,15,514
Baluchistan . . . . .	..	61,002	..	63,356	..	65,416
Coorg	300	10,540	96	19,005	64	17,617
Ajmero-Merwara . . . . .	..	8,305	..	..	..	..
TOTAL .	300	80,807	96	82,451	64	83,033

Indian States.

Hyderabad	14,086	4,86,163	6,239	4,81,140	..	..
Mysore	14,075	2,12,109	13,070	2,88,664	15,840	2,72,707
Travancore . . . . .	..	..	342	31,982	359	32,159
Baroda . . . . .	..	..	37,266	2,12,599	39,557	2,00,625
Cochin . . . . .	..	..	..	23,856	—	28,528
TOTAL .	28,161	6,98,272	56,917	10,38,241	55,756	5,34,019

STATEMENT III.

Showing Expenditure incurred on Animal Husbandry in Provinces and States in India during 1933-34 and 1934-35.

Name of the Province or State	Expenditure during	
	1933-34	1934-35
	Rs.	Rs.
Madras	98,657	1,02,104
Bombay	1,45,710	1,35,867
Sind	9,580	10,825
Bengal	70,644	54,245
United Provinces	1,14,433	1,12,459
Punjab	10,24,813	10,50,526
Burma	3,983	3,831
Bihar and Orissa	44,119	42,938
Central Provinces	98,280	96,732
Assam	1,02,500	1,06,800
North-West Frontier Province . . . . . . . . .	..	..
Baluchistan	<i>Nil</i>	<i>Nil</i>
Hyderabad	32,888	32,888
Mysore	3,08,408	2,89,481
Baroda	1,05,031	97,418
Travancore	20,272	15,930
Cochin	4,691	5,570
Bhopal	<i>Nil</i>	<i>Nil</i>
Director, Imperial Institute of Agricultural Research	3,23,400	3,51,700
TOTAL	25,07,409	25,09,314

APPENDICES.

APPENDIX I.
Showing the working of the Veterinary Department in India during 1933-34 and 1934-35.

1933-34

Province	REPORTED MORTALITY FROM CONTAGIOUS DISEASES			DISPENSARIES AND HOSPITALS.			DISTRICT WORK.					
	Pinder-Pest	Other Diseases	Total	Number of Institutions	Cases treated	Castrations performed	Cases treated	Castrations performed	Out-breaks in which inoculation was undertaken	Deaths inoculated	Inoculations	Deaths after inoculation
Madras	5,209	26,580	31,789	116	241,202	17,631	74,315	34,590	1,096	10,431	239,570	223
Bombay	17,682	9,699	27,381	107	221,848	27,176	42,208	7,197	1,112	14,613	126,077	169
Bengal	14,064	8,610	22,674	50	90,970	311	152,673	2,682	690	13,892	155,372	885
United Provinces	40,450	14,000	54,450	173	436,690	54,180	95,023	18,870	1,735	31,513	246,637	380
Punjab	33,026	3,735	36,760	294	1,318,497	267,641	438,321	245,400	3,195	14,655	610,938	986
Burma	16,517	4,575	21,092	1	2,646	12	29,655	804	8,544	116,964	1,689	
Bihar and Orissa	8,467	6,516	14,983	127	91,527	17,335	236,534	86,110	765	5,313	189,417	197
Central Provinces	25,449	12,355	37,804	103	215,305	15,214	548,142	127,475	2,696	16,100	450,637	120
Assam	12,980	7,044	20,024	3	5,632	331	92,371	23,542	475	10,771	30,002	472
N.W.F. Province	3,704	2,659	6,363	40	142,299	251,077	67,584	28,422	205	2,888	58,449	29
Sind	1,748	4,238	5,986	19	28,859	2,286	4,005	1,138	46	666	3,420	22
Punjabistan	582	6,704	7,286	10	34,688	262	36,842	26	23	557	3,373	7
TOTAL	179,877	106,715	286,592	1,043	2,830,152	633,456	1,814,791	575,042	12,842	129,463	2,220,876	5,179
Ajmer-Merwara	455	338	793	2	7,117	84	9,608	6	8	348	915	6
Coorg	651	502	1,153	5	39,301	135	5,838	408	183	604	4,001	21
Mysore	976	14,227	15,203	63	225,703	18,310	73,225	52,857	7,537	..	173,564	..
Hyderabad	15,259	6,838	22,097	91	261,970	75,222	31,639	582	11,363	212,135	192	
TOTAL	17,341	21,905	39,246	161	534,091	18,529	163,893	85,910	8,310	12,315	380,905	219
GRAND TOTAL	197,218	129,620	325,838	1,204	3,364,243	701,985	1,978,684	658,952	21,152	141,778	2,621,751	5,398

APPENDIX I—(contd.)

AGRICULTURE AND ANIMAL HUSBANDRY

APPENDIX II.

Showing the working of the Veterinary Colleges and Schools in India during 1933-34 and 1934-35.

1934-35

STUDENTS ADMITTED DURING THE
YEAR CLASSED BY EDUCATIONAL
QUALIFICATIONS.

Veterinary College or School	Course of Instruction	ADMITTED DURING THIS YEAR.		Passed final examination during the year	Failed to pass final examination	REMAINING UNDER IN- STRUCTION AT THE END OF THE YEAR.		Instruction prolonged by reason of failure to pass	Intermediates 3 ; S. S. L. C's. 24, including 2 candidates with Senior Cambridge qualifications
		Scholar- ship Holders	Others			In ordinary course	Matricula- tions		
Madras Veterinary College	3 Years course	3	24	30	11	107	35	..	..
Bombay Veterinary College	3 Years course	18	29	14	13	98	23	..	..
Bengal Veterinary College	3 Years course	..	..	..	..	..	..	..	..
Punjab Veterinary College	4 Years course L. V. P. Diploma course.	..	12	19	10	29	10	12	..
Bihar and Orissa Veterinary College.	3 Years Diploma course.	7	18	10	3	28	9	25	..
Insein Veterinary School	1 Year Vernacular course Refresher Course	5	10	17	..	12	..	5	10
	4 (Veterinary Inspectors)			..	..	..	..	..	..

1933-34

Madras Veterinary College	3 Years course	ADMITTED DURING THIS YEAR.		(5 took admission in classes B & C)	9	116	34	Intermediates 6 ; and S. S. L. C's. 25.	
		Scholar- ship Holders	Others		126	73	17	21	..
Bombay Veterinary College	3 Years course	7	11	33	18	73	17	21	..
Bengal Veterinary College	3 Years course	13	49	49	25	73	62	50	13
Punjab Veterinary College	4 Years course L. V. P. Diploma course.	..	..	..	5	30	13	12	..
Bihar and Orissa Veterinary College.	3 Years Diploma course.	4	20	9	7	17	..	24	..
Insein Veterinary School	1 Year Vernacular course	14	11	..	..	17	..	4	21

APPENDIX III.

Showing the number of cattle issued from Government Farms during 1933-34 and 1934-35.

Province	1933-34			1934-35			Total for 1933-34	Total for 1934-35	Total for 1933-35
	Bulls	Cows	Male buffaloes	Bulls	Cows	Male buffaloes			
Madras	35	31	6	9	94	55	85	6	311
Bombay	50	29	3	12	97	37	24	4	176
Bengal	66	..	..	..	66	4	..	..	16
United Provinces	411	..	64	..	475	265	..	..	459
Punjab	431	102	..	46	579	730	27	..	565
Burma	..	8	..	46	49	19	25	..	21
Bihar and Orissa	21	25	45	..	85	176	10	24	275
Central Provinces	69	59	9	3	73	213	33	1	167
Assam	..	52	43	..	24	119	58	..	108
Sind	..	6	26	..	30	62	..	4	91
TOTAL	1,141	318	127	19	325	1,930	1,211	156	1,043
<i>Imperial Farms.</i>									
Puss	..	24	..	57	81	1	24	..	44
Karnal	..	4	13	1	50	68	10	1	62
Bangalore	..	..	44	5	48	97	2	..	81
Mysore State	..	22	19	..	3	44	67	10	135
Hyderabad State	..	..	6	..	..	6	3	..	102
Travancore State	..	1	..	..	..	5	6	..	6
Cochin State	..	1	..	..	..	1	2	5	4

* Transferred to the Bangalore Institute.

APPENDIX IV.

List of Animal Husbandry and Veterinary Publications in India published during 1933-35.

No.	Title	Author	Where published
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VETERINARY SCIENCE AND ANIMAL HUSBANDRY.

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|---|--|--|---|
| 1 | <i>Agriculture and Live-stock in India</i> ,—Vol. III, parts IV, V and VI; Vol. IV, parts I to VI; Vol. V, parts I to III. Annual subscription Rs. 6 or 9s. 9d. (A bi-monthly Journal of Agriculture and Animal Husbandry for the general reader interested in agriculture or live-stock in India or Tropics.) | Issued under the authority of the Imperial Council of Agricultural Research. | Manager of Publications Delhi. |
| 2 | <i>The Indian Journal of Veterinary Science and Animal Husbandry</i> ,—Vol. III, parts III and IV; Vol. IV, parts I to IV; Vol. V, parts I and II. Annual subscription Rs. 6 or 9s. 9d. (A quarterly Journal for the publication of scientific matter relating to the health, nutrition and breeding of live-stock.) | Ditto . . | Ditto. |
| 3 | <i>The Indian Veterinary Journal</i> (The Journal of the All-India Veterinary Association). Quarterly. Annual subscription Rs. 4 or 6s. 4d. for members and students, Rs. 8 or 10s. for others. | P. Srinivas Rao (Editor). | The Editor, The Indian Veterinary Journal, 26, Wallajah Road, Madras. |
| 4 | <i>The United Provinces Veterinary Magazine</i> (English and Urdu). Monthly. Issued free to members of the United Provinces Veterinary Association. | Issued by the United Provinces Veterinary Association. | Secretary, United Provinces Veterinary Association, Lucknow. |
| 5 | <i>The Punjab Veterinary Journal</i> (Monthly). Annual subscription Rs. 8. | Issued by the Punjab Veterinary Association. | The Editor, The Punjab Veterinary Journal, Lahore. |
| 6 | <i>The Central Provinces Veterinary Journal</i> (Quarterly). | Issued by the Central Provinces Veterinary Association, Nagpur. | Government Printing, Central Provinces, Nagpur. |
| 7 | Helmint Parasites of the Domesticated Animals in India. Scientific Monograph No. 8 of the Imperial Council of Agricultural Research. Price Rs. 7-12-0 or 13s. 3d. | G. D. Bhalerao . . | Manager of Publications, Delhi. |

List of Animal Husbandry and Veterinary Publications in India published during 1933-35—contd.

No.	Title	Author	Where published
VETERINARY SCIENCE AND ANIMAL HUSBANDRY—<i>contd.</i>			
8	Proceedings of the First Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry held at New Delhi from the 20th to 23rd February 1933, with Appendices. Price Rs. 5-14 or 9s. 6d.	Issued by the Imperial Council of Agricultural Research.	Manager of Publications, Delhi.
9	Annual Report of the Imperial Institute of Veterinary Research, Muktesar-Kumaun, for the year ending 31st March 1933. Price Re. 1-8-0 or 2s. 6d.	Director, Imperial Institute of Veterinary Research, Muktesar-Kumaun.	Ditto.
10	Annual Report of the Imperial Institute of Veterinary Research, Muktesar-Kumaun, for the year ending 31st March 1934. Price Re. 1-12 or 3s.	Ditto . . .	Ditto.
11	A Description of the Imperial Institute of Veterinary Research, Muktesar, and its sub-station, the Imperial Veterinary Serum Institute, Izatnagar. Issued under the authority of the Imperial Council of Agricultural Research. Price Re. 1-4-0 or 2s.	F. Ware . . .	Ditto.
12	The Annual Administration Report of the Civil Veterinary Department, Madras, for the year 1932-33.	Issued by the Director, Veterinary Services, Madras.	Government Press, Madras.
13	Annual Administration Report of the Civil Veterinary Department, Madras, for the year 1933-34.	Ditto . .	Ditto.
14	Report of the Special Rinderpest Officer, Madras Presidency. Price Re. 1-6-0.	C. Suryanarayananmurthi.	Ditto.
15	Some Advantages of Poultry keeping (English, Tamil, Telugu, Kanarese and Malayalam). Leaflet No. 54 of the Department of Agriculture, Madras.	R. W. Littlewood .	Ditto.

List of Animal Husbandry and Veterinary Publications in India published during 1933-35—contd.

No.	Title	Author	Where published
VETERINARY SCIENCE AND ANIMAL HUSBANDRY—contd.			
16	Natural Incubation (English, Tamil, Telugu, Kanarese and Malayalam). Leaflet No. 55 of the Department of Agriculture, Madras.	R. W. Littlewood.	Government Press, Madras.
17	Brooding and Rearing of Chicks (English, Tamil, Telugu, Kanarese and Malayalam). Leaflet No. 56 of the Department of Agriculture, Madras.	Ditto . .	Ditto.
18	Lucerne (Tamil, Telugu and Kanarese). Leaflet No. 58 of the Department of Agriculture, Madras.	Ditto . .	Ditto.
19	Housing of Poultry (English, Tamil, Telugu, Kanarese and Malayalam), Leaflet No. 57 of the Department of Agriculture, Madras.	R. W. Littlewood and H. Narahari Rao.	Ditto.
20	Annual Administration Report of the Civil Veterinary Department, Bombay Presidency, including the Bombay Veterinary College, the Bombay City and Harbour Veterinary Department and the Civil Veterinary Department in Sind for the year 1932-33. Price As. 3 or 4d.	Issued by the Director of Veterinary Services, Bombay Presidency, and the Superintendent, Civil Veterinary Department, Sind and Rajputana.	Government Central Press, Bombay.
21	Annual Administration Report of the Civil Veterinary Department, Bombay Presidency, including the Bombay Veterinary College, the Bombay City and Harbour Veterinary Department and the Civil Veterinary Department in Sind for the year 1933-34. Price As. 3 or 4d.	Ditto . .	Ditto.
22	Annual Administration Report of the Civil Veterinary Department in Ajmere-Merwara (British Rajputana) for the year 1932-33. Price Re. 1-14-0 or Rs. 3d.	Issued by the Superintendent, Civil Veterinary Department, Sind and Rajputana.	Manager of Publications, Delhi.

List of Animal Husbandry and Veterinary Publications in India published during 1933-35—contd.

No.	Title	Author	Where published
VETERINARY SCIENCE AND ANIMAL HUSBANDRY—contd.			
23	Annual Administration Report of the Civil Veterinary Department in Ajmer-Merwara (British Rajputana) for the year 1933-34. Price Re. 1-14-0 or 3s. 3d.	Issued by the Superintendent, Civil Veterinary Department, Sind and Rajputana.	Manager of Publications, Delhi.
24	Breeding Bull in Bengal. Bengal Department of Agriculture Leaflet No. 4 of 1933.	Issued by the Department of Agriculture, Bengal.	Bengal Secretariat Book Depot, Calcutta.
25	Annual Report of the Civil Veterinary Department, Bengal, and Bengal Veterinary College for the year 1932-33. Price As. 6 or 8d.	Issued by the Director, Civil Veterinary Department, and Veterinary Adviser to the Government of Bengal and by the Principal, Bengal Veterinary College.	Bengal Government Press, Alipore, Bengal.
26	Annual Report of the Civil Veterinary Department, Bengal, and Bengal Veterinary College for the year 1933-34. Price As. 6 or 8d.	Ditto . .	Ditto.
27	Annual Report of the Civil Veterinary Department, United Provinces, for 1932-33. Price Re. 1.	Issued by the Director of Veterinary Services, United Provinces.	Government Printing and Stationery, United Provinces, Allahabad.
28	Annual Report of the Civil Veterinary Department, United Provinces, for 1933-34. Price Re. 1.	Ditto . .	Ditto.
29	Green Fodder (English and Hindi). Leaflet No. 13 of the Department of Agriculture, United Provinces.	Ditto . .	Ditto.
30	Cultivation of Lucerne (English, Urdu and Hindi). Leaflet No. 14 of the Department of Agriculture, United Provinces.	Ditto . .	Ditto.
31	The Art of Milking (Hindi). United Provinces, Department of Agriculture, Bulletin No. 64.	Pati Ram (Kala) . .	Ditto.
32	List of Horse and Cattle Fairs and Shows in the Punjab and Punjab States during the year 1933-34.	Issued by the Director of Veterinary Services, Punjab.	Government Printing, Punjab, Lahore.

List of Animal Husbandry and Veterinary Publications in India published during 1933-35—contd.

No.	Title.	Author.	Where published.
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VETERINARY SCIENCE AND ANIMAL HUSBANDRY—contd.

33	List of Horse and Cattle Fairs and Shows in the Punjab and Punjab States during the year 1934-35.	Issued by the Veterinary Services, Punjab.	Government Printing, Punjab, Lahore.
34	Leaflet on Surra (Urdu) . . .	Ditto . . .	Ditto
35	Leaflet on Spirochaetosis of Fowls (Urdu).	Ditto . . .	Ditto.
36	Leaflet on Sheep Scabies (Urdu)	Ditto . . .	Ditto.
37	Leaflet on Cattle Breeding (Urdu).	Ditto . . .	Ditto.
38	Note on Hissar Dale . . .	Ditto . . .	Ditto.
39	Annual Report of the Civil Veterinary Department, Punjab, for the year 1932-33.	Ditto . . .	Ditto.
40	Annual Report of the Civil Veterinary Department, Punjab, for the year 1933-34.	Ditto . . .	Ditto.
41	Prospectus of the Punjab Veterinary College, Lahore, for the Session 1934-35.	Ditto . . .	Ditto.
42	Prospectus of the Punjab Veterinary College, Lahore, for the Session 1935-36.	Ditto . . .	Ditto.
43	A Survey and Veterinary History of the Malwa Tract. Punjab Civil Veterinary Department Bulletin No. 1 of 1933 (Survey Series).	Ditto . . .	Ditto.
44	Syllabus of Lectures, etc., for the Diploma Course of L. V. P. (Punjab).	Ditto . . .	Ditto.
45	Report on the Veterinary Department of Burma for the year ending 31st March 1933. Price Rs. 2-8-0 or 3s. 9d.	Issued by the Director, Veterinary Services, Burma.	Superintendent, Government Printing and Stationery, Burma, Rangoon.
46	Report on the Veterinary Department of Burma for the year ending 31st March 1934. Price Rs. 2-8-0 or 3s. 9d.	Ditto . . .	Ditto.

List of Animal Husbandry and Veterinary Publications in India published during 1933-35—contd.

No.	Title	Author	Where published.
VETERINARY SCIENCE AND ANIMAL HUSBANDRY—contd.			
47	Report on the Investigation of Diseases of Elephants carried out at Sick Elephant Camp (No. 2) at Minbyin, Upper Burma, from December 1st, 1932 until March 7th, 1933.	J. H. Smith . . .	Superintendent, Government Printing and Stationery, Burma, Rangoon.
48	Instruction for Collection of External Parasites from Animals in Burma. Leaflet No. 1 of 1935 of the Veterinary Department, Burma.	Issued by the Director, Veterinary Services, Burma.	Ditto.
49	Instructions for the use of 'Naganol' in the Prophylactic and Curative Treatment of Surra in Horses and Mules. Leaflet No. 2 of 1935 of the Veterinary Department, Burma.	Ditto . . .	Ditto.
50	Surra in Horses. Burma Veterinary Department Bulletin No. 1 of 1933.	Ditto . . .	Ditto.
51	Annual Report of the Civil Veterinary Department, Bihar and Orissa, for the year 1932-33. Price Re. 1-3-0.	Issued by the Director, Veterinary Services, Bihar and Orissa.	Superintendent, Government Printing, Bihar and Orissa, Patna.
52	Annual Report of the Civil Veterinary Department, Bihar and Orissa, for the year 1933-34.	Ditto . . .	Ditto.
53	Annual Report of the Civil Veterinary Department of the Central Provinces and Berar for the year ending 31st March 1933.	Issued by the Director of Veterinary Services, Central Provinces.	Government Printing, Central Provinces, Nagpur.
54	Annual Report of the Civil Veterinary Department of the Central Provinces and Berar for the year ending 31st March 1934.	Ditto . . .	Ditto.
55	Report on the Mahajbagh Managerie together with the external work of the Veterinary Inspector attached to the Agricultural College, Nagpur, for the year ending the 31st March 1932.	Issued by the Department of Agriculture, Central Provinces.	Ditto.

List of Animal Husbandry and Veterinary Publications in India published during 1933-35—contd.

No.	Title	Author	Where published
VETERINARY SCIENCE AND ANIMAL HUSBANDRY—contd.			
56	Report on the Mahajbagh Managerie together with the external work of the Veterinary Inspector attached to the Agricultural College, Nagpur, for the year ending the 31st March 1933.	Issued by the Department of Agriculture, Central Provinces.	Government Printing, Central Provinces, Nagpur.
57	Revised rules for the grant of Premium to certified and selected Bulls for Breeding purposes under the premium bull scheme of the Agricultural Department, Central Provinces (Hindi and Marathi). Leaflet of the Department of Agriculture, Central Provinces.	Ditto . .	Ditto.
58	How to improve Cattle. Leaflet Nos. 1 and 2 (Revised). (English, Hindi and Marathi.)	Ditto . .	Ditto.
59	The Report on the Civil Veterinary Department, Assam, for the year 1932-33.	Issued by the Civil Veterinary Department, Assam.	Assam Government Press, Shillong.
60	The Report of the Civil Veterinary Department, Assam, for the year 1933-34.	Ditto . .	Ditto.
61	The Breeding Bull (English, Bengali and Assamese). Assam Department of Agriculture Bulletin No. 1 of 1934.	Issued by the Department of Agriculture, Assam.	Ditto.
62	Worms in Cattle (English, Bengali and Assamese). Assam Department of Agriculture Bulletin No. 2 of 1934.	Ditto . .	Ditto.
63	The Making and Use of Silage in Assam. Bulletin No. 3 of 1934 of the Department of Agriculture, Assam.	Ditto . .	Ditto.
64	Dairying and Dairy Farming. Bulletin No. 5 of 1935 of the Department of Agriculture, Assam.	Ditto . .	Ditto.
65	Silage of <i>Uridol</i> or <i>Jhora ghas</i> —wild deep water paddy (English and Assamese). Bulletin No. 7 of 1935 of the Department of Agriculture, Assam.	Ditto . .	Ditto.

List of Animal Husbandry and Veterinary Publications in India published during 1933-35—concl.

No.	Title	Author	Where published.
VETERINARY SCIENCE AND ANIMAL HUSBANDRY—concl.			
66	Report on the Civil Veterinary Department, North-West Frontier Province, for the year 1932-33.	Issued by the Superintendent, Civil Veterinary Department, North-West Frontier Province.	Manager, Government Stationery and Printing, North-West Frontier Province, Peshawar.
67	Report on the Civil Veterinary Department, North-West Frontier Province, for the year 1933-34.	Ditto . .	Ditto.
68	Annual Administration Report of the Civil Veterinary Department in British Baluchistan for the year 1932-33. Price Re. 1-12-0 or 3s.	Deputy Superintendent, Civil Veterinary Department in Baluchistan.	Manager of Publications, Delhi.
69	Annual Administration Report of the Army Veterinary Services in India for 1933-34.	Issued by the Army Headquarters, Quarter Master General's Branch.	Ditto.
70	The Annual Report of the Mysore Civil Veterinary Department for the year 1932-33.	Superintendent, Civil Veterinary Department, Mysore.	Government Press, Bangalore.
71	The Annual Report of the Mysore Civil Veterinary Department for the year 1933-34.	Ditto . .	Ditto.
72	A brief report on the Improvement of Sheep in Mysore.	A. A. Monteiro . .	Superintendent, Government Press, Bangalore.
73	Ticks on Domestic Cattle (Malayalam).	Issued by the Superintendent of Agriculture, Trichur.	Cochin Government Press Ernakulam.
74	Our Cattle (Malayalam) . .	Ditto . .	Ditto.
75	Silage (Malayalam) . .	Ditto . .	Ditto.
76	The Poultry Survey Report of H. E. H. the Nizam's Domains. Bulletin No. 7 of the Agricultural Department, Hyderabad-Deccan.	Nizamuddeen Hyder .	Government Central Press, Hyderabad-Deccan.
77	Feeding of Live-stock. Leaflet of the Department of Agriculture, Travancore.	T. C. Kochunni Pillai .	Published by the Director of Agriculture and Fisheries, Travancore.
78	Silage making in mud-walled towers (English and Hindi). Institute of Plant Industry Leaflet No. 6 of 1934.	Issued by the Director, Institute of Plant Industry, Indore.	Institute of Plant Industry, Indore.

APPENDIX V.

Key to the Diagrammatic Map of Agricultural Stations.

Research Institutes and Agricultural Colleges	Special or Subsidary Research Stations and Research Farms	Main Experimental Farms	Small Farms, District Farms and Demonstration Farms	Seed Farms	Major Cattle-breeding and Dairying Farms	Subsidiary Cattle-breeding Farms
1. Pusa (Bihar and Orissa).	1. Bangalore (Mysore) 2. Coimbatore (Madras). 3. Karnal—Botanical and Sugarcane Sub-stations (Punjab).				1. Pusa (Bihar and Orissa), 2. Karnal (Punjab). 3. Wellington (Madras).	
1. Cuttack.	1. Cuttack. 2. Berhampore. 3. Anatapalle. 4. Samalkota. 5. Marudern. 6. Guntur. 7. Nandyal. 8. Anantapurpetta. 9. Gudiyattam. 10. Tiridivaram. 11. Patur. 12. Adurval. 13. Pattiukottai. 14. Kolipatti. 15. Burilar.				1. Hosur.	1. Guntur.

16. Coonoor.
17. Kallar.
18. Nanjanad.
19. Pattambi.
20. Tuliparenha.
21. Kasargod.
22. Pillicode.
23. Nilleshwar.

POONA.	1. Surat.	1. Ratnagiri.	1. Bhadgaon.	1. Chhabodi.
	2. Nadiad.	2. Dhulla.	2. Bankapur.	2. Surat.
	3. Dhulla.	3. Jalgaon.	3. Kirkee.	
	4. Dharwar.	4. Surat.		
	5. Karjat.	5. Kirkee.		
	6. Padgaon.	6. Kopargaon.		
	7. Sholapur.	7. Broach.		
	8. Bijspur.	8. Dohad.		
BOMBAY				
	1. Kurnta.	1. Tegur.	1. Chhatrapur.	1. Mirpurkhas.
	2. Mugad.	2. Surat.	2. Bankapur.	2. Nasirabad.
	3. Gokak Canal.	3. Kirkee.	3. Kirkee.	3. Shahidkote.
	4. Hethambha.			
	5. Mohol.			
	6. Kopargaon.			
	7. Broach.			
	8. Dohad.			
	9. Viramgum.			
	10. Kundewadi Niphad			
SIND				
SAKRAND.	1. Larkana.	1. Dadu.	1. Mirpurkhas.	1. Mirpurkhas.
	2. Dokri.	2. Oderolai.	2. Oderolai.	2. Nasirabad.
		3. Lundo.	3. Lundo.	
		4. Padidam.	4. Padidam.	

Key to the Diagrammatic Map of Agricultural Stations—contd.

Research Institutes and Agricultural Colleges	Special or Subsidiary Research Stations and Research Farms	Main Experimental Farms	Small Farms, District Farms and Demonstration Farms	Seed Farms	Major Cattle-breeding and Dairying Farms	Subsidiary Cattle-breeding Farms
1. Deccs.	1. Berhampore. 2. Rangpur. 3. Krishnagar. 4. Chittura. 5. Bankura. 6. Raiganjuli. 7. Kalimpong.	1. Deccs. 2. Chittura. 3. Rajshahi.	BENGAL	1. Burdwan. 2. Berhampore. 3. Bankura. 4. Suri. 5. Krishnagar. 6. Jessor. 7. Gosba. 8. Faridpur. 9. Rangamati. 10. Comilla. 11. Barisal.	1. Deccs.	

UNITED PROVINCES

- | | |
|-----------------|----------------------------|
| 1. Cawnpore. | 1. Gorakhpore. |
| 2. Bulandshahr. | 2. Parbatgarh. |
| 3. Gorakhpur. | 3. Muzaffarnagar. |
| 4. Nainital. | 4. Mainpuri. |
| | 5. Bichpuri. |
| | 6. Hardoi. |
| | 7. Bahraich. |
| | 8. Bulandshahr. |
| | 9. Nigohi. |
| | 10. Budaud. |
| | 11. Nawabganj. |
| | 12. Meerut. |
| | 13. Ataria. |
| | 14. Hyderabad (Bara Banj). |
| | 15. Bareilly. |
| | 16. Unao. |
| | 17. Kannanpur (Cawnpore). |
| | 18. Kahl (Allgarh). |

LYALPUR.

1. Risalewala.
2. Sirsa.
3. Rohtak.

PUNJAB

1. Fazia.
 2. Karnal.
 3. Ambala.
1. Hisar.

Key to the Diagnomimatic Map of Agricultural Stations—contd.

Research Institutes and Agricultural Colleges	Special or Subsidiary Research Stations and Research Farms	Main Experimental Farms	Small Farms, District Farms and Demonstration Farms	Seed Farms	Major Cattle-breeding and Dairying Farms	Subsidiary Cattle-breeding Farms
I. MANDALAY.						
					1. Paulekoneing. 2. Hmawbi. 3. Mudden. 4. Akyab. 5. Ailammyo. 6. Pyinmans. 7. Mahialang. 8. Kantaalu.	1. Chiba. 2. Kyehnon. 3. Singaing. 4. Pwinbyu. 5. Megwe. 6. Pyu. 7. Paungde. 8. Henzada. 9. Pagan. 10. M' ubin.
BURMA					1. Tatkon.	
PUNJAB—contd.						
			4. Multan. 5. Jullundur. 6. Gurdaspur. 7. Kala Shah Kaku. 8. Rawalpindi.	4. Ludhiana. 5. Beas. 6. Kangra. 7. Ferozpur. 8. Gujratwala. 9. Gujrat. 11. Jhang. 12. Manwall 13. Campbellpur. 14. Attari.	4. Risalewala. 5. Chillianwala. 6. Sargodha. 7. Multan.	

11. *Jhaton.*
12. *Padu.*
13. *Nyamglebin.*
14. *Frapon.*
15. *Bassein.*
16. *Thegan Gwasoo.*
17. *Minya.*
18. *Mingan.*
19. *Myingyan.*
20. *Zigon.*

BHARAT AND ORISSA

- | | |
|-------------------|------------------------|
| 1. Sabour. | 1. <i>Kanke.</i> |
| 2. <i>Sabour</i> | 2. <i>Patna.</i> |
| | 3. <i>Sepaya.</i> |
| | 4. <i>Cuttack.</i> |
| | 5. <i>Sabour.</i> |
| | 6. <i>Purnia.</i> |
| | 7. <i>Gaya.</i> |
| | 8. <i>Netrakona.</i> |
| | 9. <i>Nawada.</i> |
| | 10. <i>Jamul.</i> |
| | 11. <i>Hanks.</i> |
| | 12. <i>Darbhanga.</i> |
| | 13. <i>Siwan.</i> |
| | 14. <i>Bikranganj.</i> |
| | 15. <i>Sirhi.</i> |
| | 16. <i>Chipli.</i> |

Key to the Diagrammatic Map of Agricultural Stations—contd.

Research Institutes and Agricultural Colleges	Special or Subsidized Research Stations and Research Farms.	Main Experimental Farms	Small Farms, District Farms and Demonstration Farms	Seed Farms	Major Cattle-breeding and Dairying Farms	Subsidiary Cattle-breeding Farms
1. Nagpur.	1. Akola. 2. Ralpur.	1. Powarkhers. 2. Adiartal. 3. Nagpur.	1. Chhindwara —emid. 17. Chalbasa. 18. Sambarpur.	1. Saugor. 2. Tharsa.	1. Tellnabheri. 2. Bilaspur. 3. Chandkhuri. 4. Drug. 5. Seoni. 6. Betul.	1. Richai. 2. Nagpur (Garhi). 3. Pendri. 4. Elliehpur. 5. Bod. 6. Powarkhers. 7. Ratona 8. Wara-Sonol. 9. Yeotmal. 10. Buldana. 11. Borgzon. 12. Sindewahl. 13. Dindori.
2. Habiganj.	1. Jorhat. 2. Titabor.	1. Karimganj. 2. Sylhet.	ASSAM	1. Jorhat. 2. Upper Shillong.	1. Jorhat. 2. Sylibet. 3. Upper Shillong.	1. Khampara. 2. Sylibet.

NORTH-WEST FRONTIER PROVINCE	
1. Peshawar.	1. Tarnab
	2. Naurang Seraf.
	3. Dehra Khan Ismail

BALUCHISTAN

1. Quetta.

HYDERABAD STATE	
1. Hyderabad.	1. Sangareddi.
	2. Warangal
	3. Rudrur.

HIMAYAT SAGAR.

1. Himayat Sagar,
Hyderabad.

MYSORE STATE	
1. Bangalore.	1. Chickballahalli
	2. Naggenhalli
	3. Hunsur
	4. Marthur.
	5. Balekonnur (Head-quarters of U. P. A. S. I., Coffee Scientific Officer).
	6. Babur

BANGALORE.

1. Mysore Irwin
Canal Farm.
2. Yellachchi balli.

Key to the Diagrammatic Map of Agricultural Stations—contd.

Research Institutes and Agricultural Colleges	Special or Subsidiary Research Stations and Research Farms	Main Experimental Farms	Small Farms, District Farms and Demonstration Farms	Seed Farms	Major Cattle-breeding and Dairy Farms	Subsidiary Cattle-breeding Farms.
1. Baroda.	1. Baroda. 2. Jagudan. 3. Amreli. 4. Vyara.	BARODA STATE			1. Makarpura.	
1. Quilon.	1. Alleppey. 2. Koval. 3. Nagarkoil. 4. Kottarakara. 5. Puliya. 6. Cape Comorin.	TRAVANCORE STATE			1. Alwaye. 2. Oachira. 3. Vaikom.	1. Ernakulam. 2. Wedakkancheri. 3. Mulanthuruthy.
1. Trichur.	1. Ernakulam.	OOCHEIN STATE	1. Thiruvankulam. 2. Trichur.		1. Trichur. 2. Trichur.	
1. Gwalior. 2. Ujjain.	1. Gwalior. 2. Ujjain.	GWAJOR STATE			1. Gwalior. 2. Ujjain.	1. M a h a r a j p u r (Gwalior). 2. Ujjain.

KASHMIR STATE

1. Shalabagh,
Sri-
nagar (Pratap
Model Farm).
2. Jammu (Gole-
mandar).

RHOPAL STATE

1. Xabi Bagh.

1. Patiala.
1. Patiala.

PATIALA STATE

1. Bassi.
2. Henna.
3. Dhuri.

NON-OFFICIAL

- Indore (Central India
Institute of Plant
Industry).
Ranchi (Bihar and Orissa
Tea Research Institute).
Tocklai (Assam Indian
Tea Association).

Sidhpur (Madras, U. P.
A. S. I.).

Dibrutta (Assam
Indian Tea Associa-
tion).

APPENDIX VI.

List of Research Schemes of the Imperial Council of Agricultural Research in operation to which funds had been allotted up to the end of 1935.

Serial No.	Sanctioned Schemes.
	<i>A.—Sugar Schemes.</i>
1	Sugar Technologist and staff :— (a) Sugar Cable Service. (b) Construction and testing of improved juice boiling <i>bel</i> . (c) Indian Sugar Trade Information Service.
2	Grant to Shahjahanpur Research Station for a detailed examination of new seedling cane.
3	Grants to United Provinces, Bihar and Orissa and Punjab Government for experiments in designing of a satisfactory small power sugarcane crushing mill.
4	Bombay-Deccan Sugarcane Research Scheme.
5	Deputation of a Chemist to Bhopal to test Khan Bahadur Hadi's process of manufacturing sugar by open-pan method.
6	Grant to Harcourt Butler Technological Institute, Cawnpore, for sugar technology.
7	Scheme for the Establishment of a Sugarcane Research Station in Bihar and Orissa and for the appointment of a Sugarcane Specialist.
8	Scheme for the Establishment of a Sub-station of the Coimbatore Imperial Sugarcane Station at Karnal.
9	Scheme submitted by the Imperial Mycologist, Pusa, for research on Mosaic and other cane diseases at Pusa.
10	Hadi's Commercial Test at Bilari under Lala Hari Sahai Gupta.
11	Bengal Scheme for Sugarcane crushing and <i>Gur</i> boiling.
12	Sugarcane Seedling Testing Station at Dacca.
13	Deputation of Sugar Technologist to Europe and America.
14	Grant to the Mysore Durbar for breeding of thick canes.
15	Economic enquiry into the cost of production of crops in the principal sugarcane and cotton tracts in India.
16	Chief Economist and his staff.
17	Research on the genetics of Sugarcane at the Imperial Cane Breeding Station, Coimbatore.

List of Research Schemes of the Imperial Council of Agricultural Research in operation to which funds had been allotted up to the end of 1935—contd.

Serial No.	Sanctioned Schemes.
<i>A.—Sugar Schemes—contd.</i>	
18	Research on Sugarcane in the Madras Presidency.
19	Establishment of a Sugarcane Research Station in the Punjab.
20	Investigation into various problems of sugar industry in the United Provinces.
21	Establishment of a Research and Testing Station for the indigenous system of <i>gur</i> and sugar manufacture by the Sugar Technologist to the Council.
22	Extension of Sugarcane work at the Jorhat Experimental Station, Assam.
23	Investigation into the production of <i>Khandvari</i> Sugar in the United Provinces and Bihar and Orissa.
<i>B.—General Agricultural Schemes.</i>	
24	Grant to Dr. K. C. Mehta for—
	(a) Investigation of rusts of wheat and barley.
	(b) Investigation into the Physiological forms of wheat rusts.
25	Botanical Sub-station at Karnal.
26	Grant to Dacca University.
27	Hemp Marketing Officer.
28	Investigation into the Vitamin Contents of Mangoes.
29	Professor Parija's Scheme of Water-hyacinth.
30	Professor Mukerjee's Scheme of Research into Properties of Colloid Soil Constituents.
31	Professor Mahalanobis' Scheme :—
	(1) Investigation on experimental errors in field trials.
	(2) Statistical Studies relating to agricultural work in India.
32	Dr. A. N. Puri's scheme of the standardisation of Physico-chemical single value measurements most suitable for Indian soils.
33	Grant to Principal, Agra College, Agra, for investigation into the rusts of wheat and barley.
34	Dr. Bhatnagar's Scheme :—
	(a) Effects of Ions on Plant Growth.
	(b) Physico-chemical properties and fertility of soil.

List of Research Schemes of the Imperial Council of Agricultural Research in operation to which funds had been allotted up to the end of 1935—contd.

Serial No.	Sanctioned Schemes.
<i>B.—General Agricultural Schemes—contd.</i>	
35	Professor Dastur's Scheme " Rice Physiology ".
36	Dr. Chaudhuri's Scheme " Withertip of Citrus trees ".
37	Establishment of a new branch of Agricultural Meteorology under the Indian Meteorological Department, Poona.
38	Grants to provinces for collecting data on manurial experiments conducted in the past.
39	Appointment of Physical Assistant on the staff of Agricultural Chemist, Bengal.
40	Co-ordinated scheme of Rice-Research in Provinces.
41	Award of a prize for a bone crusher worked by :—
	(a) Animal power.
	(b) Mechanical power.
42	Special Locust Research Staff.
43	Grant to Punjab Government for Locust Research.
44	Locust Bureau.
45	Experimental consignment of mangoes to the Empire Marketing Board.
46	Research work on potatoes in Madras.
47	Financial assistance to the Oil Technological Section of Harcourt Butler Technological Institute.
48	Investigation on the Organic Constituents of Indian Soils by Professor J. C. Ghosh.
49	Preparation of cheap synthetic manure from town refuse and waste materials by the Indian Institute of Science, Bangalore.
50	Investigation of the chemistry of malting cholam.
51	Extension of work on " Quality " in crops by the Indian Institute of Science.
52	Professor J. C. Seth's scheme for Investigating an electric method of Hygrometry.
53	Scheme of Malting and Brewing qualities of Barleys in the United Provinces, Punjab and Bihar and Orissa.
54	Grant to the Burmah Shell Oil Storage and Distributing Co., Bombay.
55	Enquiry into the supply of coconut products and coconut oil in India.

List of Research Schemes of the Imperial Council of Agricultural Research in operation to which funds had been allotted up to the end of 1935—concl.

Serial No.	Sanctioned Schemes.
<i>B.—General Agricultural Schemes—concl.</i>	
56	Statistical Section of the Bureau of Agricultural Intelligence.
57	Provincial scheme of fruit research, Bombay Cold Storage Fruit Scheme.
58	Horticultural schemes in the provinces of Madras, Bengal, Punjab, United Provinces, Bihar and Orissa
59	Dry farming research scheme in the Bombay-Deccan, Hyderabad, Madras and the Punjab.
60	Improvement of castor crop in India by His Exalted Highness the Nizam's Government.
61	Headquarters Marketing Staff.
62	Potato breeding research in North India.
63	Tobacco Co-operative Experiments.
<i>C.—Animal Husbandry Schemes.</i>	
64	Testing of Drug Plasmoquine.
65	Investigation into the measure of control in existence for the prevention of adulteration of milk and other dairy products.
66	Mr. A. E. Slater's scheme of goat breeding.
67	Investigation of Indian Fish Poisons and other Indian Forest Products for their insecticidal properties.
68	All-India Legislation for the control of animal diseases.
69	Appointment of a Physiological Chemist to study animal nutrition at Dacca.
70	Appointment of Veterinary Investigation Officers in Provinces.
71	All-India Animal Husbandry Bureau.
72	Disease investigation officer, North-West Frontier Province.
73	Investigation into the most suitable and economic methods of combating different types parasitic infection in ruminants in the fields, etc.
74	Investigation of Johne's diseases among cattle in Mysore.
75	Extension of work on animal nutrition in Madras Presidency.
76	Appointment of a Statistician for the compilation of certain statistics relating to feeding scales, etc., in Military Dairies.
77	Investigation for vaccination of cattle against rinderpest.

MAP OF INDIA SHOWING AGRICULTURAL STATIONS.

SCALE
Miles 0 50 100 150 200 250 300 350 400 450 Miles.



